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THE CORNELL ENGINEER

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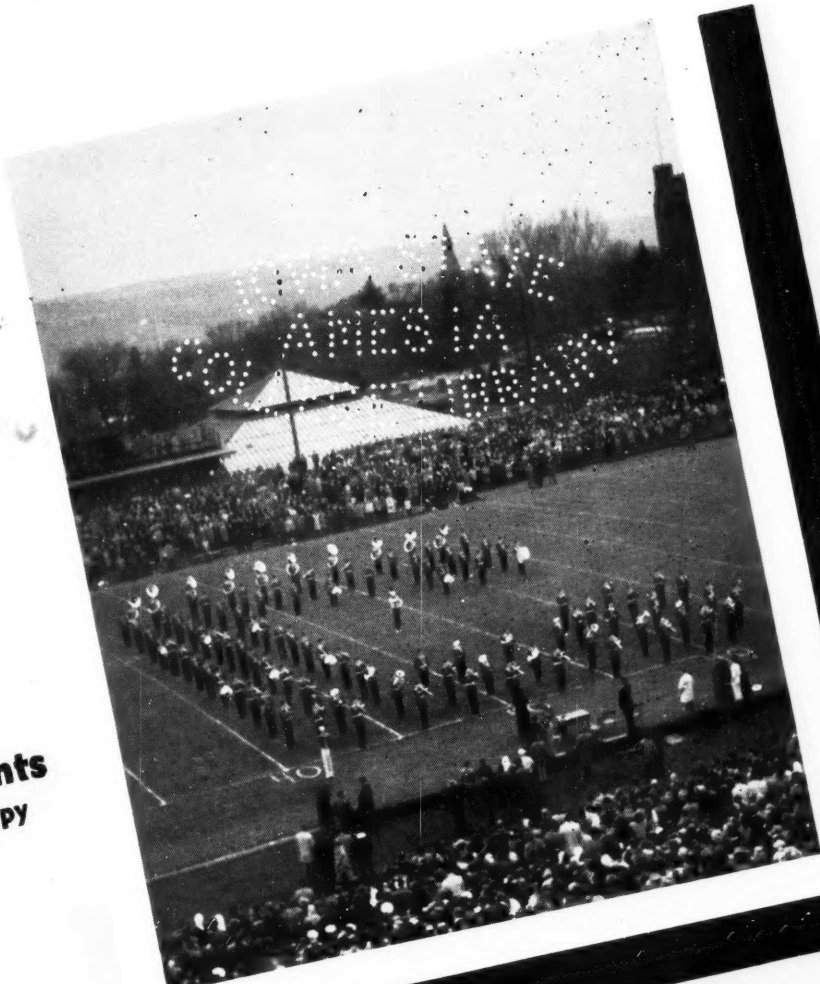
October, 1947



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Founded 1885

The CORNELL ENGINEER

Volume 13 — Number 1

CONTENTS

Cover: The Big Red Band forms a "C" on Schoellkopf Field at half-time.

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This issue, October, 1947.

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A TWO CREDIT COURSE
IN THE NEW CURRICULUM

Introducing Organic Chemistry

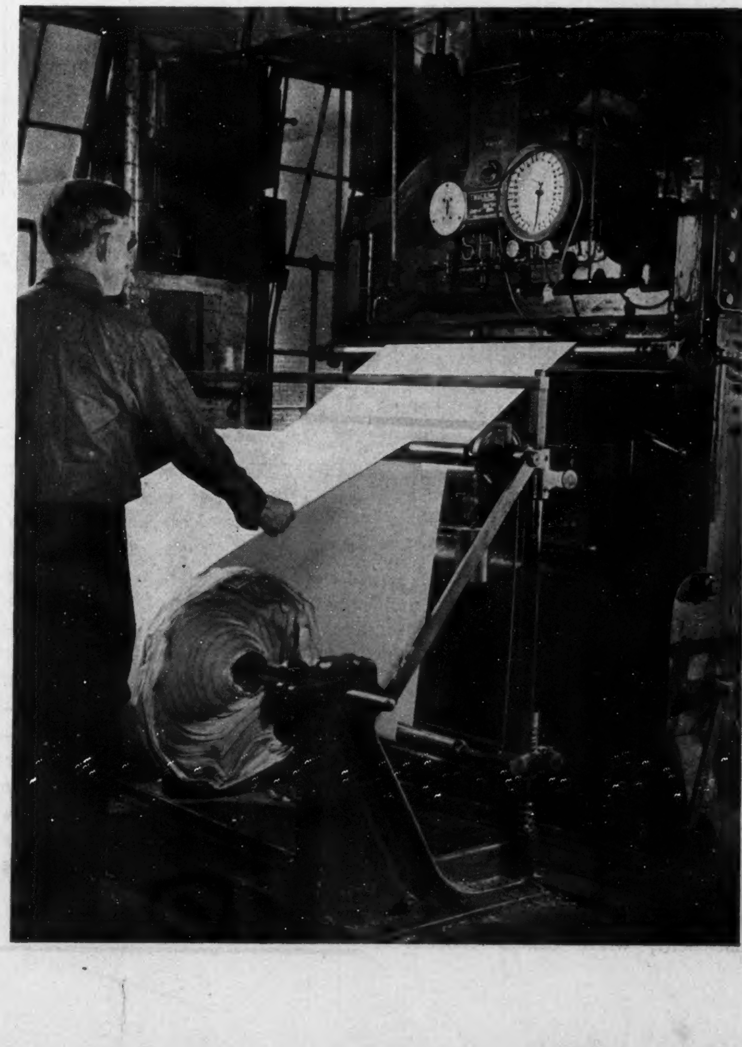
By ALFRED T. BLOMQUIST

Associate Professor of Chemistry

A Chemist Explains Why Organic Chemistry Is So Important To All Engineers

One of the finishing steps in the production of coated fabrics is embossing to produce the desired surface appearance. By choice of proper plasticizer, coated fabrics can be made which are permanently flexible and free from "lacquer lifting."

Cut courtesy The Resinous Reporter



INTRODUCTION of a two-hour course in organic chemistry into the curriculum of mechanical and electrical engineering and engineering physics has been effected with the object of affording the student engineer a better understanding of the role of organic chemistry in modern industry.

Prior to the early part of the nineteenth century the chemist recognized a large group of substances present in or obtained from living plant and animal organisms as differing mysteriously from the acids, bases, and salts associated with inanimate matter (inorganic substances) and was familiar with a number of useful processes of great antiquity which involved organic compounds.

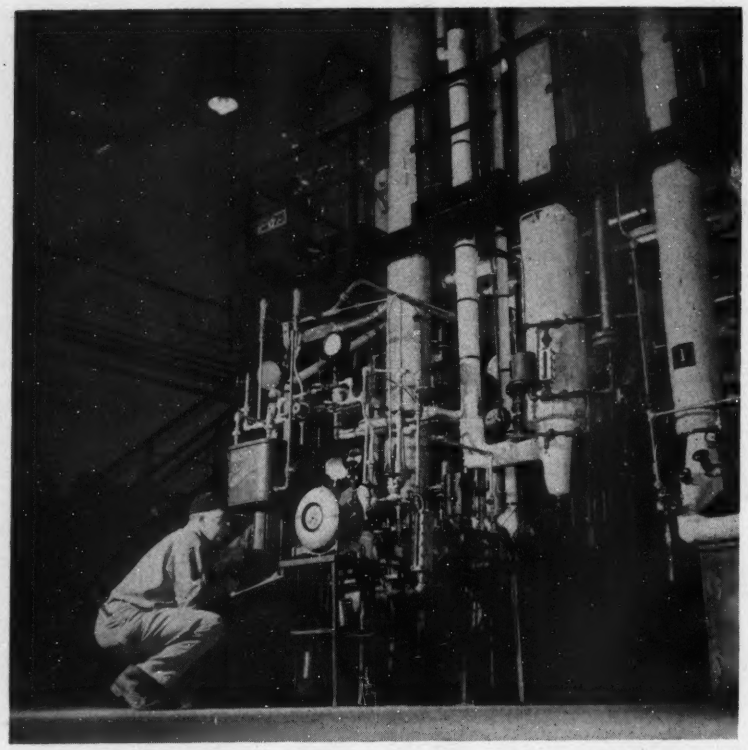
Representative of these were the production of wine by the fermentation of the sweet principle of the grape, the souring of wine to form vinegar, dilute acetic acid, soap manufacture from animal fats and vegetable oils, and the dying of fabrics with various vegetable dyestuffs such as indigo and the madder root (alizarin).

Wohler's Demonstration

Modern organic chemistry may be considered to have had its beginning in 1824 when Wohler, a young German chemist working

Skilled laboratory technician at work in an organic laboratory. Processes in large scale chemical industries are first discovered and perfected in the laboratory.

—Photo courtesy U. S. Industrial Chemicals, Inc.



Operation and maintenance of this hydrocarbon synthesis pilot plant would be conducted principally by chemical engineers with chemists to assist in studying reaction products. Design of the unit would call for mechanical engineers with the assistance of drafting and electrical engineers. Where special electronic measuring devices are needed, physicists may be called upon.

Photo courtesy Standard Oil Company; cut courtesy Franklin Institute

with Berzelius in Sweden, demonstrated that an organic compound could be synthesized from inorganic materials without the aid of a complex life process. This refutation of the concept of "vital force" together with subsequent demonstrations that organic compounds are governed by the same fundamental laws which apply to inorganic substances served to dispel somewhat the impenetrable attributes of organic materials and inspired a tremendous activity in the field of organic chemistry.

Definition

Although, as a consequence of Wohler's and other early workers' studies, the designation "organic" lost some of its original connotation, the term has persisted as a convenient and fairly descriptive means of classifying a large group of substances having a number of characteristics in common. Most organic compounds contain hydrogen, a large number also contain oxygen, many have nitrogen present as a constituent, while others contain halogen, sulfur, phosphorus, and other elements. All of them contain carbon as the one essential element, so that organic chemistry is now defined as the chemistry of the compounds of carbon.

Scope of Field

Within this definition organic chemistry embraces some several hundred thousand completely defined compounds. Practically, however, to the well-informed individual, organic chemistry does not simply bring to mind an enormous number of carbon compounds but rather portrays countless articles which are manufactured and used in daily living. Today organic chemistry is concerned, for example, with such important aspects of living as the composition of food and its digestion, the manufacture of fabrics from natural and synthetic fibers, the development and utilization of dyestuffs, drugs, antibiotics, cosmetics, flavors, soaps and detergents. The development of heat and power from organic fuels, the manufacture of improved paints, varnishes, lacquers, lubricants, and adhesives; the utilization of natural and synthetic rubber in constructing tires, and of innumerable plastic materials in the fabrication of articles of every description are indicative of some of the extensive

THE AUTHOR

Professor Alfred T. Blomquist graduated from the University of Illinois with an A.B. degree in 1928; in the following four years he received his M.S. and Ph.D. degrees from the same institution. In 1932-'33, Professor Blomquist was a National Research Council Fellow in Chemistry at Cornell; in 1941-'42, he served as a Cornell Research Associate, becoming an assistant professor of chemistry in 1942. During the war he was Director of Research on High Explosives for the Office of Scientific Research and Development at Cornell. At the present time he is director of Research on the rubber research program sponsored by B. F. Goodrich at Cornell, and is consultant on organic chemistry to the research department of that company.

Professor Blomquist

fields into which organic chemistry has entered.

The development of synthetic organic chemistry as an industry of world-wide importance was initiated in 1856 by Perkins, a young English student of the German chemist A. W. Hofmann who accidentally prepared the first synthetic dyestuff, mauveine, from a compound derived from coal tar while attempting the synthesis of the natural occurring drug quinine. Immediately there developed in England, France, and Germany a whole new industry based on coal tar. Its growth was phenomenal and its achievements spectacular. Synthetic indigo, alizarin, and hundreds of new dyestuffs, drugs and medicinals of every description, flavors and perfumes, as well as military high explosives such as TNT and Picric Acid were introduced to the world in rapid succession.

Germany Grew Rapidly

The most rapid and vigorous growth took place in Germany with the result that by 1914 the synthetic organic chemical industry was for the most part a German industrial activity under the complete control of the German Dye Trust. World War I found America almost completely dependent upon Germany for organic chemicals.

U.S. Engineers Contribute

Faced with the necessity of building an industry capable of making the United States self-sufficient in these all-important products, the American chemists and engineers in a few years succeeded in creating a synthetic organic chemical industry second to none. The growth of the industry in this country since 1920 has been truly phenomenal and unquestionably a very large part of this growth may be attributed directly to the contributions of men who were not specially skilled as chemists but who had had their training in the various fields of engineering. One of the most outstanding examples of the many non-chemists who have played an important part in the chemical industry is Thomas Midgley, a graduate engineer from Cornell. His contributions in the fields of anti-knock fuels (tetraethyl lead) and refrigerants (Freon) are recognized as achievements of the first rank and their importance to our present way of life is easily appreciated.

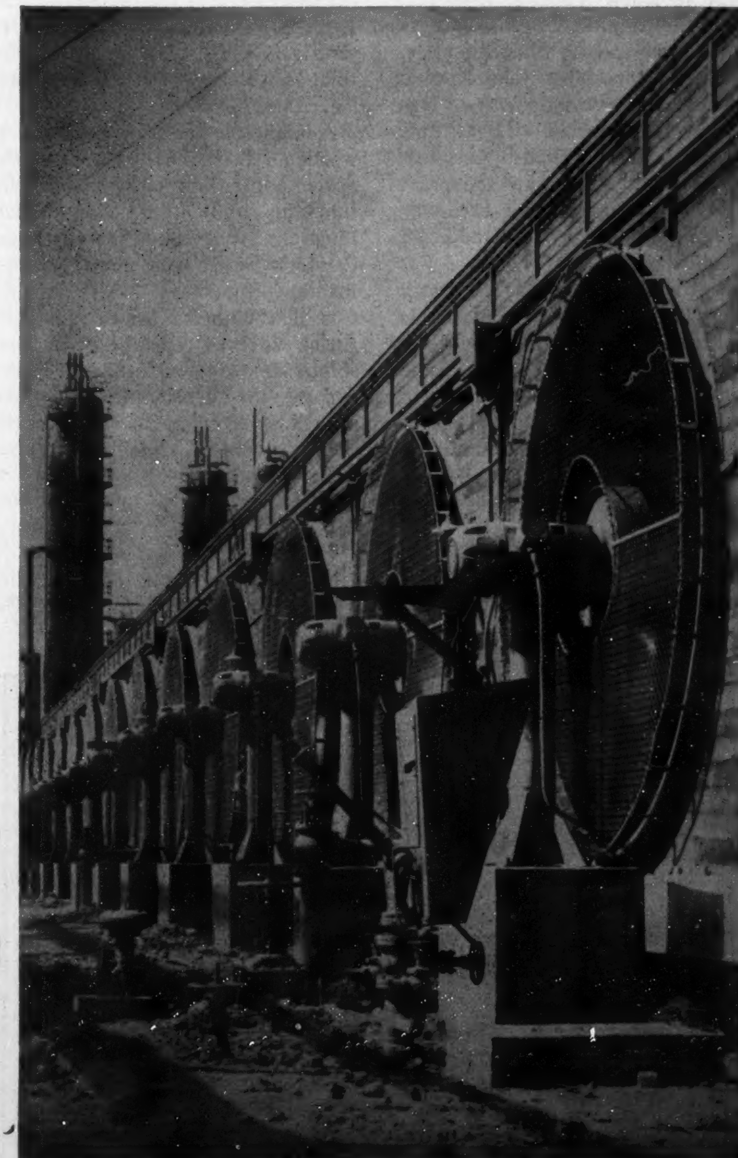
Just as the organic chemical industry prior to 1914 was almost entirely German-controlled, so the majority of skilled chemists in America were German-trained. Today, fortunately, we have in America a substantial body of competent chemists as well as engineers, trained in American institutions, capable of maintaining the continued growth and development of our chemical manufacture as the leading chemical industry in the world.

Personnel Needed

With industrial organic chemistry expanding from the field of coal-tar products into almost every conceivable industrial activity, the need for highly trained personnel in all the branches of engineering as well as chemistry and physics has

(*Continued on page* 30)

These giant fans cool large quantities of circulating water for condensation of petroleum vapors in cracking processes, which increase the yield of gasoline from crude oil. ***Wide World Photo, cut courtesy The Resinous Reporter***



THE STORY OF THE SLIDE RULE

By HERBERT F. SPIRER, EP '51

All illustrations from Franklin Institute Library
Photos by Thomas F. Rupsis

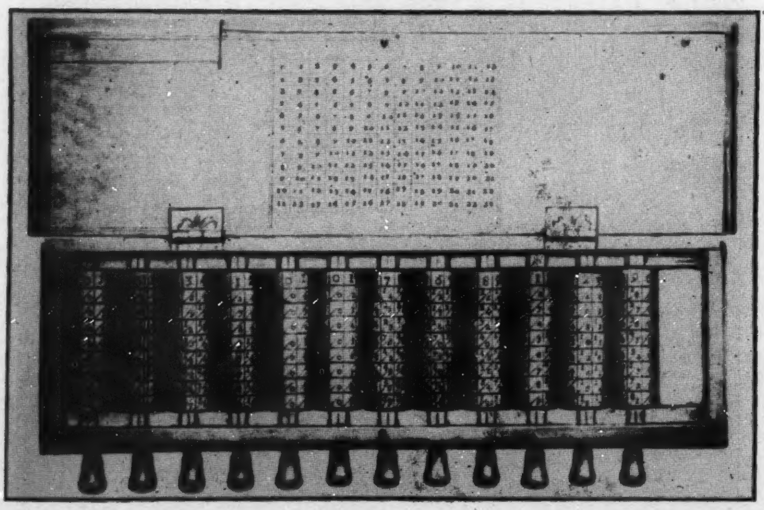
EVERY arithmetic or mathematical calculation was a tedious, lengthy procedure at the beginning of the seventeenth century. Scientists, navigators, and merchants spent days performing mechanical operations of calculations that a freshman engineer can do today in a few minutes. However, about the time the Pilgrim Fathers were setting sail for Massachusetts, a Scotch philosopher, John Napier, announced his development of logarithms. Napierian Logarithms were gradually adopted by a calculating world, which saw the great advantage of multiplying or dividing long numbers by mere addition or subtraction.

A friend of Napier's, Henry Briggs, suggested the use of ten as a base, so that decimal multiples of any number would have the same mantissa, which was not true of Napierian logarithms. Briggs logarithms are those in common use today.

Six years after the discovery of logarithms, in 1620, an English professor of astronomy, Edmund Gunter, designed a logarithmic line of numbers. This logarithmic line, called a Gunter's Line, was a straight line along which distances were marked off proportional to the logarithms of the numbers from 10 to 1000. The Gunter's Line was similar to the A-scale on your slide rule, consisting of two complete logarithmic cycles.

A Gunter's Line mounted on a wooden rule was called a Gunter's Scale. Logarithms of trigonometric functions and other navigational functions were also mounted as Gunter's Scales and achieved immediate popularity with navigators. The Gunter's Scales for navigation were to continue in use on shipboard for two hundred years, despite the development of improved slide rules, some of which were especially designed for navigational purposes.

Napier's rods, cylindrical form, probably made at the beginning of the eighteenth century. (*From Catalogue of the Collections in the Science Museum, South Kensington, by Baxandall.*)



In 1630, a short time after Gunter's inventions, Edmund Wingate, an English mathematician used two Gunter's Scales, which he slid past one another to perform calculations. He held the scales together by hand, and had no runner or pointer of any kind.

An English theologian interested in mathematics, William Oughtred, made in 1632, without knowledge of Wingate's work, a similar sliding rule. Oughtred also invented the first circular slide rule. His circular rule was much the same as today's, a logarithmic line laid out around a circle, and two pointers pivoted at the center. These rules found a limited number of advocates among astronomers and surveyors.

Numbers on Cylinders

The idea of arranging numbers on cylinders to facilitate manipulation is attributed to Gaspard Schott, who described the arrangement in 1668. The illustration shows twelve boxwood cylinders in a box. Each cylinder can be turned on its axis independently, and bears on its surface the 10 series of numbers multiplied "no times," "once times," etc. up to "nine times" so the multiplication can be set very quickly. The instrument as pictured is set for the multiplication of the number 3100768129 by any other number.

An indifferent surveyor, who spent most of his time teaching mathematics, Seth Partridge, is known as the father of the modern slide rule. Up to his time the rules were separate and held together by hand. Partridge constructed a rule which consisted of three Gunter's Scales. Two of these scales were fastened together by brass strips, and the third scale slid between them.

These early slide rules were

crude, and rarely accurate. They were constructed of unseasoned wood, and likely to warp overnight. On rainy days the slider would stick and on clear days, it would rattle loosely. Scales were of indiscriminate lengths and the logarithmic distances were figured separately for each rule. Markings were scratched or stamped into the wood and difficult to read. Nevertheless, these rules were used by many scientists. In 1675, Sir Isaac Newton was using a sliding rule to solve numerical equations. Newton also suggested, for the first time, the use of a runner as a device for comparing scales that were not adjacent. Newton, however, failed to construct a runner, and his suggestion went unnoticed.

Taxes Make Progress

The collection of His Majesty's Royal Excise Taxes, distasteful as it may have been to British merchants, proved to be a great factor in spreading the use of the slide rule. The amount of the excise was based on the measurement of liquid quantities in odd-shaped containers, and volumes of lots of timber and stone. The process of estimating the amount of liquid or contents of odd lots of timber and stone was known as gauging. Up to 1675 gauging was accomplished by measuring certain dimensions and referring to charts to establish the quantity measurement. The charts required considerable calculating to produce a final answer, and were frequently in error.

Henry Coggeshall, a practical scientist, designed in 1677 a sliding rule for the measurement of volumes and quantities. Coggeshall's rule was a wooden rule with a slider, but no runner. Scales were arranged so as to facilitate multiplication, division, squaring, square root, and trigonometric operations. Convenient gauge points, such as pi, or the number of gallons in a cubic foot, were marked off on the scales. Rules were available in a variety of lengths, but the one foot rules were preferred then, as now. This rule was soon in wide use by excise officers and merchants. It was the most widely used rule during the Eighteenth Century, and was in use as late as 1874.

John Ward, collector of the Royal Excise Tax on Wines and Liquors at the Port of Liverpool, was known as a stickler for accuracy. Rather than use the inaccurate pocket slide rules of his day, 1680, Ward staggered around the docks bowed under the weight of a wooden rule six feet in length. But then, you could hardly expect to find him using a log-log duplex only sixty years after the invention of logarithms . . .

Thomas Everard, an officer in the Excise, in 1683 developed a rule similar to Coggeshall's. Everard adapted his rule specifically to gauging for the Excise. His rule was used for gauging by many Excise officers during the Eighteenth Century, and is so typical of the rules in use during that period, that it bears description.

The rule was made from seasoned wood, and was an inch square in cross-section, and about one foot in length. The two opposite faces were slotted and a slider moved in each slot. No runner was used and calculations were made only on the four pairs of adjacent scales. Measuring scales and Gunter's Lines were marked along the edges. Important gauge points were designated with small brass pins. A few changes were made in the Everard rule by Charles Leadbetter, another tax-collector. He revised the scales and added a third slider.

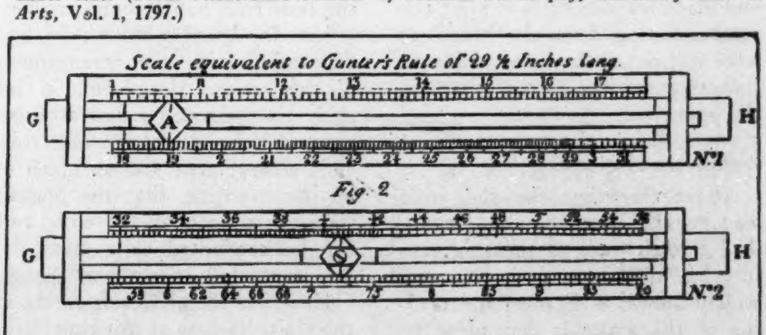
There was some difference of opinion among the tax collectors, and one of them, John Ward, protested the use of the rules. He said that he "prefers to gauge a vessel by the pen only; that is, without the help of those lines of numbers upon sliding rules, so much applauded, and but too much practised, which that best do but help to *guess at the truth,* and may be justly called an idle ignorant way of doing business as compared with that of the pen." Ward, however, later qualified his statement by saying that he spoke only of the pocket rules, those only a foot long. Ward was noted for using a wooden rule that was six feet long.

Technical Advances

As the slide rule came into its own, methods were developed for more correctly measuring off distances on the scales. Moisture- resistant woods were used, and improvements in accuracy closely followed improvements in manufacturing methods. However, as you know, the accuracy of the slide rule is dependent on the space between divisions. The number of significant figures which may be read increases as the distance between divisions increases. One way to increase accuracy, therefore, is to lengthen the rule. There is a limit to the size of a rule beyond which it becomes inconvenient to use, and most effort was directed towards putting effectively longer scales on the common twelve-inch rule.

Numerous, and usually involved schemes were resorted to in order to lengthen the linear scale without increasing the length of the rule. One of the more effective devices

One of Nicholson's Slide Rules of 1797. No. 1 is the upper side; No. 2 is the under side. (From Nicholson's *Journal of Natural Philosophy, Chemistry and the Arts,* Vol. 1, 1797.)



was using staggered scales, breaking up the two log cycles into five separate scales, arranged one below the other. It took a good memory to keep from reading the wrong scale. In the Nicholson slide rule, as shown, the log line is spread over both sides of the rule, allowing the rule to be shortened without sacrificing accuracy.

The circular rule enables a long scale to fit in a small space. Circular rules on which the logarithmic line is spiral, instead of circular, make possible unusually long lines in a small space, and were resorted to frequently.

It was not until 1755 that someone finally stumbled upon the obvious—that all operations could be performed with one logarithmic cycle rather than two. This change immediately doubled the length of all the scales in use.

Reciprocal Operations

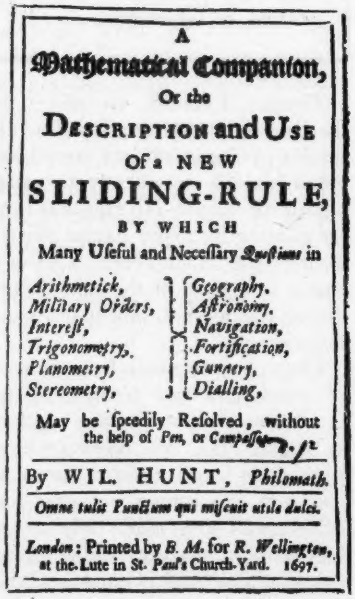
William Pearson, an English astronomer, was the first person to invert the slider for reciprocal operations. Shortly afterward, about 1750, inverted scales began to appear on sliders. In 1778, when the American colonies were fighting their war for independence, John Robertson, a mathematician, put a runner on his slide rule. His rule was thirty inches long and especially designed for navigational use. The runner was a straight edge and had an intricate system of tangent screws for coarse and fine adjustment. Robertson's rule was apparently too much for the sailors, and they continued to use their Gunter's Scales and dividers.

More attention was now being paid to the marking of the scales. James Watt found the existing scales unreliable for his use in designing steam engines. He designed and made his own rules to meet the more exacting demands. Markings were still put on by hand and were somewhat subject to the whims of the engravers.

French Innovations

About this time the slide rule was gaining popularity in France. The French took to the rule rapidly, as the decimal system was widely known in France, and reading of the scales is dependent on a knowledge of the decimal system. In 1815 one M. Lenoir devised a machine for dividing and engraving scales to any length. Lenoir's device would mark eight rules at one time, with great accuracy.

Then Peter Roget, a medical doctor, developed the log-log scale. Originally the log-log scale was used in the calculations of musical chords and relationships. Scientific musicians the world over were soon familiar with log-log scales. Eventually the musicians were to be succeeded by engineers who found the log-log scales equally helpful.


A

Mathematical Companion,

Or the

Description and Use

Of a NEW

SLIDING-RULE,

BY WHICH

Many Uſeful and Neceſſary Queſtions in

Arithmetick,	Geography,
Military Orders,	Aſtronomy,
Intereſt,	Navigation,
Trigonometry,	Fortification,
Planometry,	Gunnery,
Stereometry,	Dialling,

May be ſpeedily Reſolved, without the help of Pen, or Compaſſes, &c.

By WIL. HUNT, Philomath.

Omne tulit Punctum qui miſcuit utile dulci.

London: Printed by B. M. for R. Wellington, at the Lute in St. Paul's Church-Yard. 1697.

The title page of one of the early books on the slide-rule printed in 1697.

The slide rule became widely known in France. All schools of higher education taught its use, and applicants for civil service were required to be familiar with the slide rule. The French engineers adopted the slide rule, but a young artillery officer, Lt. Amadee Mannheim, was dissatisfied with the arrangement of the scales. Mannheim, in his spare time, devised a new arrangement of the scales of the slide rule. This arrangement was so much of an improvement, that the present wide acceptance of the slide rule can be attributed to a great degree to the influence of this change.

How was the slide rule faring in the United States at this time? Not too well. In 1844 a circular rule for business calculations enjoyed a burst of popularity in New York and Massachusetts, and then disappeared. After 1850, when Mannheim's rule was spreading throughout Europe, Washington University offered a course in the slide rule for engineering and scientific students.

In 1881 Thatcher put forth his famous cylindrical rule, which was designed for standing on a desk. The scales were mounted as elements of the cylinder, which lay on its side. Thatcher's rule was handy, accurate and useful. It is still on the market.

Ten years later, in 1891, an American writer of scientific articles, William Cox, began popularizing the Mannheim rule. He described the rule and gave detailed instructions for its use. He wrote prolifically and the knowledge of the slide rule spread. American manufacturers began to produce variations of the Mannheim rule which are still in use today with few changes.

Manufacture Improves

The adoption of the Mannheim type rule by Europe was aided by the efforts of numerous scientific writers who popularized the rule by explaining its functions and advantages. Improved manufacturing techniques made possible lower costs and higher quality, enabling the slide rule to become a standard scientific tool.

Today there is an almost infinite variety of slide rules available. Besides the many variations of the Mannheim arrangements, there are slide rules adapted to every need. There is no limit to the special purposes in calculation for which the basic principles of the slide rule may be utilized; chemistry, sewer design, air-conditioning, navigation, photography, surveying, insurance rates, etc.

It is not possible to say that the history of the slide rule is complete. The slide rule of today may still have undeveloped potentialities for increased utility that will some day make our modern slide rules as obsolete as Gunter's Scales. The greatest pages in the history of the slide rule may well be ahead of us, and who can say but that the readers of this magazine will make that history?

MASS PRODUCTION METHODS
IMPROVE RADIO FIDELITY

The Automatic Felting Of Loudspeaker Cones

By VICTOR K. PARE, E, '51

TO say that the paper cone of a radio loudspeaker is merely an important part of the set is to give it less prominence than it deserves, for it is the responsibility of the cone to convert the audio frequencies received by its voice coil into a resonable facsimile of the varied and often weird sounds that are produced in the radio studio. This is not an easy task, yet it has only been within the last decade that there has been general interest in developing the physical properties of the paper in the cone to fit it for its complex job.

Until less than twenty years ago, all cones were made by cutting a circle from a flat piece of paper, removing from it a section like a piece of pie, and cementing the resulting edges together to produce the desired shape. Unfortunately, this simple, logical process did not endow the cone with certain very desirable acoustical properties, since the paper companies did not consider it worth their while to produce special paper in the small quantities required by the radio industry. This situation led to the development of a method of molding, or felting, the pulp directly into the shape of the cone, and this has been universally adopted. An interesting new improvement on this process is the machine pictured, which not only performs the entire molding operation automatically, but allows the maker to choose at will the properties that each part of the cone shall have. It has been installed at the RCA Manufacturing Company's Camden, New Jersey, plant.

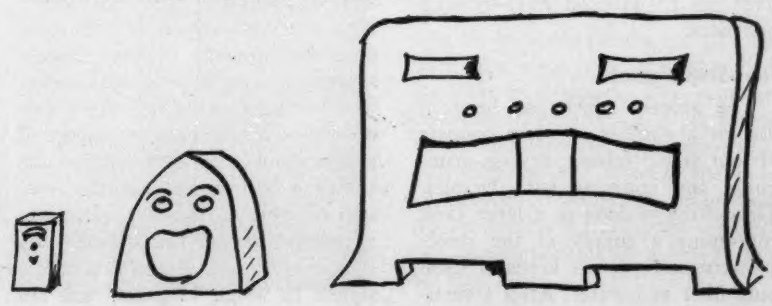
Quite interesting and essential to an understanding of the machine and its purposes are an examination of some of the properties required of cones, and a short review of the history of the industry.

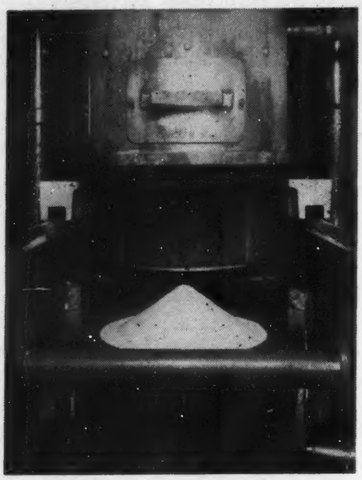
Acts As Piston

The purpose of the cone is, of course, to act as a piston which, when driven by the magnetic forces on its voice coil, will alternately compress and rarify the adjacent air to produce sound waves of the proper frequency, without too much distortion or disturbance. To accomplish this, the apex must be hard and strong enough to transmit the vibrations of the voice coil to the rest of the cone, the periphery must be flexible enough to allow the vibration to occur freely, and the body must possess a property known as compliance. Compliance is the ability of the interlocked fibers to buckle slightly without damage, allowing the paper to be stretched or compressed longitudinally. The phenomenon that makes compliance necessary is an unavoidable decrease toward the center of the vibrating area of the cone as higher frequencies are reached. Obviously, if only the inner portion of the cone is vibrating while the periphery is not, stresses are set up which will buckle the cone unless its fibrous structure has the necessary compliance. These are examples of the properties required of cones and will serve to illustrate the kind of considerations which must be given weight in developing a felting process. The paper formerly used to form cones came rather far from satisfying these requirements, and the strains set up in the paper by bending it to shape made matters still worse.

These defects were remedied by the introduction of the molded cone, whose composition could be varied at the discretion of its maker, and which needed no bending or cementing to hold it to its shape and simultaneously distort its properties. Its worth is proven by the fact that Hawley Products Company, pioneer in its manufacture, was founded and began making

When radios have different tone qualities, the reason may often be found in the physical properties of their speaker cones.





Closeup end view of machine shows cone on male die of single platform, where it has been deposited by carriage moving away in center. Drying die (with handle) will soon start down to meet cone rising on platform.
Photo courtesy R.C.A. Mfg. Co.

cones commercially in the depth of the last depression, and has flourished ever since. This company had inherited its equipment and management from a radio firm that had experimented several years before with molded cones, but had made no serious attempt to market them. The new company, however, launched itself wholeheartedly into the felting business, and had only to demonstrate its product alongside a flat-paper cone to make a sale. It was not many years before no loudspeakers worthy of the name were being made without molded cones.

RCA began using molded cones in 1938, and elected to make them in its own plant, to be operated under a license from Hawley Products Company. The two companies have since kept in fairly close touch on the subject, and RCA, as evidenced by the installation of the new machine, has kept itself up to date on fiber-forming processes.

Four-Step Process

The process which has been in use for a number of years consists of four steps; felting, drying, trimming, and spraying with lacquer. The felting is done in a large tank containing a supply of the stock, a mixture of various kinds of dyed pulp fiber and water. Atop a vertical sliding column in the tank is a porous male die, or screen, in the shape of a cone, which periodically submerges itself in the stock for a timed interval. During this interval the space inside the die is automatically connected to a vacuum system, which pulls water from the stock through the many small holes in the die, leaving a packed layer of pulp on top. The waste water is discharged from a trap into a drain pit under the tank, and the column rises to bring the die above the surface. There the operator places a female die over the cone, turns a vacuum valve, and lifts off the cone, leaving the male die free for the next cycle.

The pulp has now been felted, or deposited in the shape of a cone, and it is next dried in a gas-heated press, to which it is transferred by the operator. The press closes for a timed interval, and then opens and relieves itself of the cone by a compressed air blast. Trimming is done on a rotary machine using sharp knives, and the cone is sprayed with lacquer to stiffen it. The lacquer is dried in a large gas-heated, open-ended oven using a variable-speed conveyor belt to regulate drying time. The apex, which must transmit force to the rest of the cone, is given an extra coat of lacquer for greater stiffness.

30 Percent Rejected

Many millions of cones have been made by this method, which has proved itself quite effective. While it is not a continuous process as is ordinary papermaking, the felting cycle is measured in seconds, and it makes cones quite rapidly. It has, however, some disadvantages which are worth considerable effort to correct. One of the more important difficulties is the fact that some thirty per cent of the cones made are rejected for incorrect weight. The amount of pulp deposited varies with the composition of the stock and the pressure in the vacuum system, among other things, hence it is not easy to control. A twelve-inch cone is supposed to weight 12 grams, and may not vary more than one-half gram from this nominal weight. Obviously, variations in weight change the stiffness and inertia of the cone, and a cone designed to weigh 12 grams will not vibrate in the intended manner if its weight is 10 grams.

Another problem encountered is that of cleaning the male screen after each felting cycle. Inevitably a few particles of pulp fiber adhere to the screen as the wet cone is lifted off, and these would begin to plug the holes in the screen if they were not removed at the end of each cycle. A water spray is used for this, but it tends to drive some of the fibers into the screen, where they must sooner or later be reckoned with by more drastic methods. Further, the operator can hardly be expected to handle the heavy transfer tool with the maximum of care, and eventually the dies require maintenance. Since the stock mixture used in the tank is at best a compromise between the different types that would ideally be needed in the apex, body, and periphery in the cone, much improvement would result if each of these areas could be made from a separate, tailor-made stock mixture.

Recognize Needs

It is not surprising, then, that considerable effort has been devoted to designing equipment that can produce cones of consistently uniform weight, keep its felting screen free of loose pulp, handle the heavy tools with the care and respect they deserve, and make each part of the cone from the type of pulp best suited to it. In the first place, the problem seemed to call for the elimination of the felting tank and its accompanying evils, and substitution for it of some method of measuring out definite quantities of stock, and distributing the proper amount of each mixture to each part of the cone. In addition it appeared that the work of hauling the heavy transfer tool from place to place should be entrusted to some suitable mechanism to reduce wear and tear on both tools and operator.

The arrangement which was evolved to replace the felting tank turned out to be not only more efficient than its predecessor, but simpler as well. The male felting screen no longer dives into the stock mixture to pick up what pulp it can, but instead rises up to meet the open end of a cylinder the same diameter as the screen. Enough water is introduced through an out-

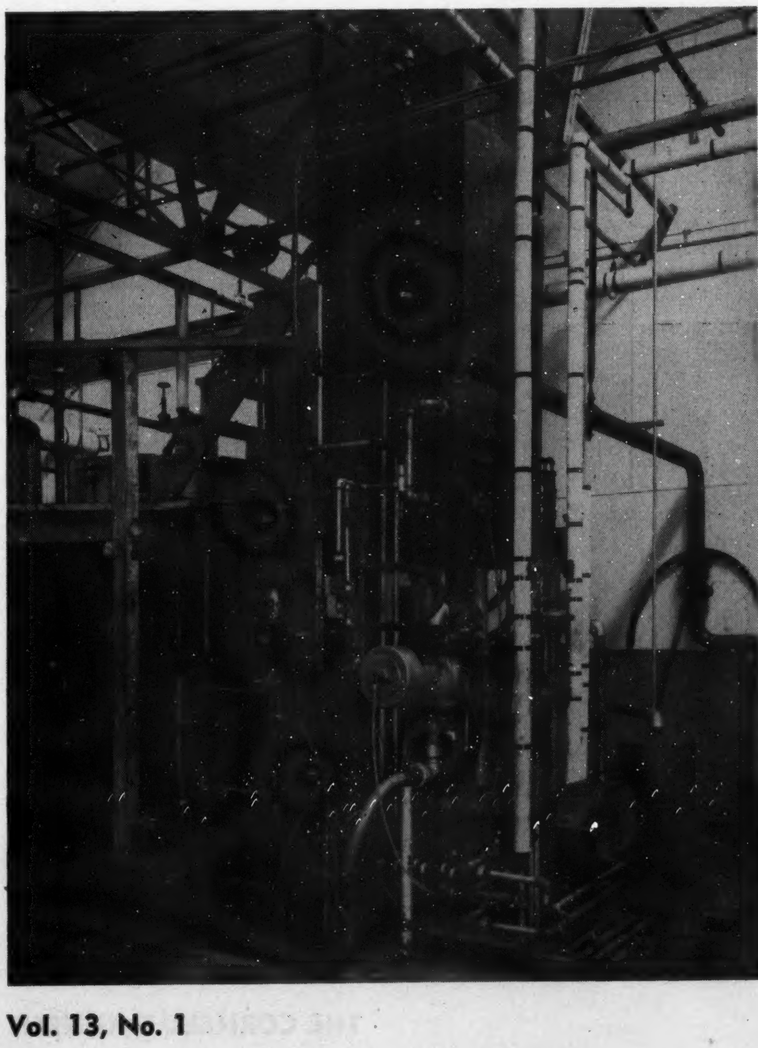
let inside the screen to float away all pulp particles remaining from the previous cycle, and to nearly fill the cylinder with water. A measured amount of pulp is then dropped in through a valve above and mixed with the water by a short compressed air blast, after which the water is drawn out into the vacuum system and collected in a trap. This leaves the wet carcass of a cone of controlled weight on the screen, from which it can be removed by a transfer tool. One of the best features of this method is that several concentric cylinders can be used, so that each will form a part of the cone. The different stock mixtures used will blend into each other where they meet, making a cone with hard apex, compliant body, and flexible periphery.

Since it was decided that the transfer and drying operations should be performed automatically, the felting arrangement just described became part of a compact unit designed to manufacture cones automatically, in a continuous process. The resulting machine is shown in the accompanying photographs.

Its mechanism is supported between two "Meehanite" side frames 45 inches high, 85 inches long, and 20 inches apart. The transfer motions are carried out by three main moving parts, a three-position carriage that rolls back and forth along the tops of the side frames, one two-position vertically moving platform in the center of the machine, and one single-position vertically moving platform at the output end. In addition there is a hydraulically operated, gas-heated drying press whose die mates with the one on the single platform. The cones are formed, transferred, dried, and ejected with apexes up, so that the carriage and press have female dies while the platforms below have male dies.

This view of the felting machine shows the output end and the valve control cams, at lower right of machine. Drying press and counterweights for center platform are visible on this end. Large box above machine is four-compartment stock supply tank. Wooden stock storage tanks appear in background.

Photo courtesy R.C.A. Mfg. Co.



Fewer Rejects

On one of the positions on the carriage is mounted the felting cylinder described earlier. When the cylinder comes into alignment with th stock supply pipe and the proper male felting screen on the double platform, the cone is felted, and then is transferred by a series of steps to the drying platform, from which it is ejected when dry by a compressed air blast. The machine may be felting one cone, holding another in the process of transfer, and drying a third simultaneously, so that each cone follows its predecessor by a period much less than the time necessary to felt and dry each one. The machine thus is able to produce two twelve-inch cones per minute. This is no improvement over the rate of the felting-tank method, but it must be remembered that the felting tank operator produced 30 per cent rejects, while the machine produces practically none. In addition, the machine need not stop for lunch and can operate with full efficiency 24 hours a day.

The machine is quite interesting to watch in operation, although some of its motions are hidden by a maze of piping which earned it the nickname, "the big pipe organ" among the mechanics who installed it. The principal movements are visible, but the mechanism which actuates them is not, so that the motions appear to the uninitiated eye to be spontaneous, as if each part knew what to do and controlled its own movements. The carriage and the counterweighted platforms move ponderously and smoothly, and every thirty seconds the machine gives off a snort of compressed air and ejects a fresh cone with all the pompous pride of a hen laying an egg.

A WAR BABY
GROWS UP

Wire Recording Comes of Age

By LEONILDA ALTMAN, EP '51

WHEN Norman Corwin, top radio writer and reporter, flew around the world on a 37,000-mile trip, his main piece of equipment was a wire recorder, which he used to record interviews with people in all walks of life, including the Prime Ministers of England and Australia, a day laborer in India, the Presidents of Poland and Czechoslovakia, a sheep shearer in New Zealand, the discoverer of penicillin, and the head of a Russian collective farm. These and many others he later wove into a series of dramatizd "One World Flight" broadcasts for CBS. They served to give the broadcasts an unparallelled degree of authenticity, since by hearing these first-hand recordings instead of synthetic sound effects, the listener was very easily able to imagine himself as part of a street scene in Shanghai, as a guest of a Russian banquet, or as a member of the Indian National Congress.

The very characteristics of the wire recorder which made it ideal for Mr. Corwin's purposes first attracted the attention of the armed forces during the war, since it was found to be nearly perfect for recording sound under battle conditions. The invention, which had lain in nearly total obscurity since its first trial at the turn of the century, was therefore suddenly unearthed and developed to its present degree of excellence. It was first used to an appreciable extent in the campaigns of North Africa and Sicily.

George Jean Nathan, dean of drama critics, and Margaret Cullen Banning, magazine author, have their impromptu remarks recorded by the wire recorder for later condensation for Reader's Digest.

History of Method

Before the development of the wire recorder, two methods of reproducing and recording sound were in common use. These were (1) cutting or inscribing or embossing of a soft surface by a stylus vibrating with the frequency and amplitude of the sound (the method employed in making phonograph records) and (2) exposing sensitized film to a light whose intensity changes with the amplitude and frequency of the sound and past which the film is moved at a uniform rate(utilized in the movie sound track). Both of these methods require bulky equipment and some processing after recording. This is especially true of the film.

To overcome these disadvantages some other method had to be found, or rather rediscovered. For at the Paris Exposition of 1900, H. V. Poulson, a Danish physicist, demonstrated his "Telegraphone," a new sound recorder utilizing the principle of magnetization. Poulson obtained a U. S. Patent on this device, but nothing further came of it until 1924. At that time, Dr.

Stille, a German physicist and engineer, began to work on possible improvements in the device. His apparatus was dubbed the "Blattnerphone," and was first used by the British Broadcasting Company in 1930. Subsequent advances were made prior to the present war, but it was the war itself which provided the greatest impetus. Today, Bell Telephone Laboratories and General Electric have produced models for general sale to the public.

Principle Is Simple

The basic principle of the wire recorder is a simple one. A wire, made of a ferro-magnetic alloy and traveling at a uniform rate of speed, is first "erased" of previous magnetic impressions by a D.C. electro-magnet. A magnetic field strength, varying as the amplitude and frequency of audio-speech currents, is then impressed upon the wire. Playback is accomplished by passing the magnetized substance, at recording speed, through or near a coil. The different magnetic field strengths induce a varying voltage corresponding to the original audio input. This voltage is then amplified. (See Fig. 1.)

There are two ways in which the magnetic field may be impressed upon a moving ferro-magnetic substance. One is laterally, i.e., across the thickness of a moving wire or tape, and the other is longitudinally, i.e., along the length. (See Fig. 2.) Poulson's original Tele-

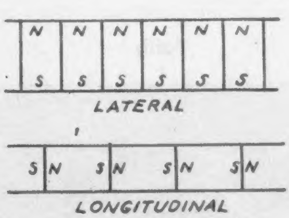


FIG. 2

graphone utilized the former type, since the recording medium was a magnetic tape that could not rotate as it moved along and thus cause distortion. Two pole pieces for the recording operation are usually used instead of the one shown in the diagram in Fig. 1, and are placed directly opposite one another to produce lateral magnetization. When longitudinal magnetization is desired, the two pole pieces are not directly opposite, but are "offset" a distance apart along the length of the wire of some thousandths of an inch. (See Fig. 3.) The length of the wire which at any given instant is in the effective field of the recording head is often termed the "slit width," by optical analogy.

It is the product of the slit width and the speed at which the wire moves which determines the highest frequency at which the device will be able to record (in all cases except when the amplifier feeding the recorder has a very low upper frequency limit). For instance, if it were desired to record a tone of 1000 cycles per second frequency, it would be necessary for the slit width to contain a length of the wire that had not previously been recorded upon every two-thousandths of a second (because the field reverses during each cycle.) If the slit width is doubled, the wire needs to be pulled twice as fast to obtain this condition. If the wire speed is halved, the slit width must be halved, etc. Therefore, it is imperative to keep the slit width as small as possible in order to raise the effective upper frequency limit without increasing wire speed to such a point that the bulk of wire which may be conveniently spooled and placed in the recording machine will give only a few minutes of recording, instead of the hour-long recordings which are now being made.

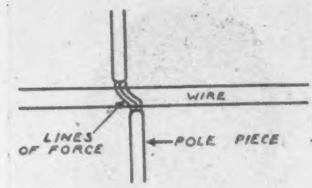


FIG. 3

The ability to produce long, uninterrupted recordings is only one of the many advantages of the wire recorder. Unlike the two other common types, a magnetic record needs no processing, but may be played back immediately after rewinding. (This rewinding is the one disadvantage yet to be overcome, since an hour-long recording necessarily takes a long time to rewind.)

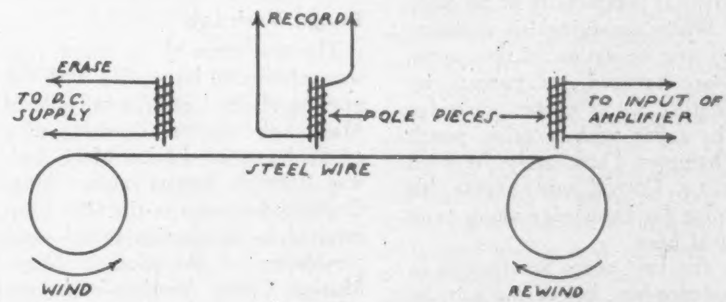


FIG. 1

Since a record may be made while the instrument is in practically any position, and since the fidelity of the sound produced is little influenced by shock or vibration, records can be made under difficult conditions that previously made any recording impossible. The steel wire itself is relatively indestructible, and therefore offers a more permanent record than was previously available. It can be used indefinitely, or it may be wiped clean of former impressions and used over again.

Known Before War

These superior qualities of wire recordings were recognized even before the war and were utilized both here and abroad. In particular,

(Concluded on Page 34)

Scotty

PROMINENT

K. Scott Edwards, ME

Son of "Soc" Edwards, M.E. '10, Scotty Edwards showed signs of mechanical perspicacity at an early age. While satisfying his curiosity about the operation of fire arms, he once amazed his parents by detonating a .30 caliber cartridge in the cellar with a prick punch and hammer. Fortunately, he lived to enter Cornell and pursue his yearning for knowledge along more rational lines.

In the two years Scotty was in attendance here before the war, he cut an enviable swath on the campus. Standing first in his freshman class, he was awarded a McMullen Scholarship. Outside activities included Glee Club and swimming. As a sophomore, he managed to hold his class position and, besides continuing his work with the Glee Club, sang in a town choir. In the remaining spare time he worked for meals and practiced with the crew.

When the war came along, Scotty joined the Army Air Corps. True to form, he graduated first in his class from navigation school. For the following eight months, he instructed aerial navigation. A good part of his flight time was spent in a Catalina, which, he asserts, has aeronautical characteristics similar to those of a bathtub.

It didn't take Scotty long to get reaclimated to college life after his sojourn in the Army. As far as studies are concerned, he made the Dean's List for the third consecutive year and stood second in his class at the end of the sixth term.

As a Junior, he was rather busy with his many commitments. His election to Tau Beta Pi is especially noteworthy. He was again active in the Glee Club. In the Junior Week show and on the Glee Club spring tour, he sent large audiences into fits of laughter over his skit on phonetic punctuation. Without giving the convulsed listeners a chance to recover, he would launch into a garbled gismo about "Ali Theeva and the Forty Babs," or "The Loose that Gaid the Olden Geggs." Incidentally, he has accumulated a volume of such stories, from which he reads to fascinated sunbathers on the roof of Baker Dorm.

Taught Mech Lab

The first term of his senior year was culminated last spring with the grading of the last of a tall pile of Mech Lab reports. Teaching nine credit hours of Junior Mech Lab was Scotty's largest undertaking. Continued interest in the Glee Club resulted in his election to the vice-presidency of the Cornell Men's Musical Clubs. Another important achievement during this term was his election to the Savage Club, an organization of entertainers with chapters in England, Australia, and Ithaca. At meetings, members of this club must be prepared to perform at an instant's notice. One of Scotty's recent acts was a rendition of school songs on a peculiar violin he fashioned from a cigar box.

After getting his degree, Edwards intends to do graduate work in mathematics and physics. A fraternity award, which he won in his senior year, will finance part of this work. He is toying with the idea of going into the teaching profession after finishing his studies.

Faith E. Gregory, CE

Faith Ethel Gregory arrived at Cornell University from Norwalk, Connecticut, in September, 1942, and, although she was matriculated in the College of Arts and Sciences, she hadn't a very clear idea of what she intended to take up. She was very fond of mathematics, but didn't want to do work of a statistical nature. While studying with a friend one day she discovered homework that was more to her liking than Latin or ancient history. Her new discovery was engineering.

After a very encouraging interview with Director Malcolm of the School of Civil Engineering, Faith wrote a long letter home asking her parents to please, please let her study such fascinating subjects as strength of materials, construction, and sewage disposal. Her parents agreed. From then on she took all her electives in engineering.

In 1946 Faith graduated from the Arts College and also received notice of her election to Phi Beta Kappa. She will soon be the holder of another degree in civil engineering, and is already the proud owner of the women's badge of Tau Beta Pi. Shortly after her entrance into civil engineering, Faith was elected secretary of the Cornell Student Chapter of the A.S.C.E. She also participated in the founding of Pi Omicron, women's honorary engineering society.

With all her achievements, Faith also finds time for hobbies. During dead hours she can usually be found at the Straight, deeply engrossed in a game of bridge.

Faith

ENGINEERS

Shirley A. Ogren, ME

Biologists and psychologists may argue that one is born an actress, or a doctor, or an engineer, but if they're not, our Shirley certainly had an early start towards her chosen profession. Shirley was the second girl in a family that wanted a boy and it wasn't long before she more or less took the place of a boy in companionship with her father, an engineer himself. Her admiration for her father and her favorite childhood occupation of helping him build furniture and fix things around the house early led her to a liking of mechanical things.

When she went to George School, a Friends' school in Bucks County, Pennsylvania, she deviated slightly from this path and majored in languages—just adding one more accomplishment to her versatile background. But when she graduaated, engineering seemed a natural choice for her college studies, and she entered Cornell in June of 1944.

In spite of the difficulties of being a woman in a man's field, Shirley's college career has been more than remarkable. In her first year, her average soared somewhere up around 95, and after three and a half years of college, it still rests around "92 point something."

But if you think that Shirley's college career has been one of constant work, all night cramming periods over her books, and no outside interests, you have another think coming. To begin with, she has earned part of her college expenses by working as a desk girl in the various dorms, assisting in Sibley Library, projecting movies in the Willard Straight Theater, and acting as an assistant in the materials department. Furthermore, she has spent two summers working at DeLaval Steam Turbine Company.

Shirley's outstanding scholarship enabled her to be one of the first three women ever to be recognized by Cornell's honorary engineering society, Tau Beta Pi.

A Camera Fan

Her enthusiasm knows no bounds. With some of her engineering sisters, she helped organize Pi Omicron, a society for engineering women. She is an avid camera fan, and can be found in spare moments puttering around the darkroom which she rigged up in an overgrown closet in her sorority house.

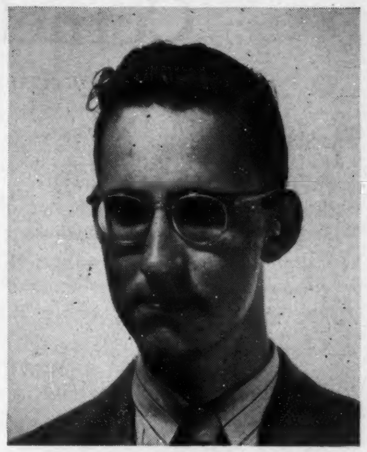
Her popularity has been recognized by her election to the position of Secretary-Treasurer of the Cornell chapter of the American Society of Mechanical Engineers, and treasurer of her sorority, Delta Gamma.

She is a constant source of amazement and admiration to her sisters, who can't understand how she can study books that look like incomprehensible hieroglyphics to them and still get to bed by 10:30 every night. As one of her sorority sisters commented admiringly one evening, "Y'know, it's not easy to be so darn smart, and so darn swell at the same time."

Shirley

Robert T. Harnett, EE

Bob Harnett is a tall, slim Cornellian who has "not been awastin' his time at Cornell." Bob holds a Bachelor of Electrical Engineering degree which he received in June. This term he is back at Cornell to obtain a Bachelor of Mechanical Engineering degree.



Bob

Bob, who is only twenty, entered Cornell in July of 1944. Just a month before, he had donned cap and gown for graduation exercises at Chaminade High in Dayton, Ohio. A busy man in high school, editor of the school paper and editor of the year book, he found that the accelerated program at Cornell gave him more than enough work to occupy his time. A recipient of a McMullen scholarship, he has maintained this scholarship for eight terms by doing excellent work and making Dean's List five times.

Bob joined the Newman Club during his first term at Cornell and has been treasurer of the organization the past two years. Of the club's numerous activities, an overnight pig roast at Mount Pleasant is the most vivid in his mind. In the summer of '45, when the Navy was well anchored at Cornell, Bob and another civilian plus eighteen or twenty V-12 recruits obtained a pig from the Vet school, had it roasted at a bakery, and took off for Mount Pleasant. Bob testifies that the roast pork was delicious.

Bob joined the AIEE in the spring of 1946 .He was elected to Eta Kappa Nu, honorary electrical engineering society in the fall term of 1946. Along with his school work that term, he assisted by teaching the computing period of the direct current machinery course once a week. He hopes to go into power

(Concluded on Page 42)

Cornell Society of Engineers

107 EAST 48TH STREET 1947-1948 NEW YORK 17, N. Y.

CARL F. OSTERGREN, *President* ....Rockwood Road West, Plandome, N. Y.
CREED W. FULTON, *Executive Vice-President*
The Cambridge, Alden Park, Philadelphia 44, Pa.
PAUL O. REYNEAU, *Secretary-Treasurer and Representative, Cornell University Placement Service*, 107 East 48th St., New York 17, N. Y.
KARL J. NELSON, *Recording Secretary* ....5 English Village, Cranford, N. J.
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KARL J. NELSON, *Vice-President* ....5 English Village, Cranford, N. J.
GEORGE C. BRAINARD, *Vice-President* ....1200 Babbitt Rd., Cleveland, Ohio
LINTON HART, *Vice-President* ....418 New Center Bldg., Detroit 2, Mich.

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

Carl F. Ostergren

President's Message

It is a considerable pleasure to address the members of the Cornell Society of Engineers as your new president. This position is of course an administrative one rather than one necessarily involving any recognition of professional accomplishment—of which the ranks of Cornell engineering alumni are so full. Yet a sense of having been honored by one's fellows is a natural and an enjoyable reaction.

I can think of no reason why we cannot look ahead to a fruitful year in furthering the objectives of the Society which are stated above in the masthead, and I thought it would be interesting to increase your acquaintanceship with some of those who will be carrying on the work of the organization this year.

The officers as now constituted—we hope there will be more regional officers before the year is through—are stated in the masthead. The indispensable Paul Reyneau needs no introduction, and Karl Nelson is slated to carry on capably as before. I am particularly glad that Creed Fulton is up there as Executive Vice-President, both because of his frequently demonstrated ability and enthusiasm, and also because his election was a further step in recognizing the national scope of the Society.

I wish particularly to call your attention to the names of George C. Brainard and Linton Hart as the regional Vice-Presidents representing the new Cleveland and Detroit sections, and to ask Cornell engineers in those areas to give them their full support.

The work of the Society is also very largely carried on by the standing committees. In new committee chairman assignments this year are:

Bernard A. Savage, of The Celotex Corporation, Chicago. Barney was a dynamic president of the Society three years ago, and has undertaken the job of Chairman of Regional Branches. We need very much to continue the revitalization of regional activity which has occurred since the war. Tell Berna had to ask to be relieved because of his load in organizing the big machine tool show in Chicago this fall. Tell did an excellent job and we have a fine successor in Barney.

Larry Waterbury, of Parson, Brinckerhoff, Hogan and Macdonald, New York, is taking on the New York Meetings assignment after several years as Chairman of the Membership Committee, during which period a remarkable increase in membership was realized. Lewis M. Leisinger, of Shell Oil, will continue as Vice-Chairman of the Meetings Committee.

The Membership Committee will be headed by William L. Glenzing, formerly head of publications for the A.S.C.E. and now associated with the consulting firm of Burns & Roe in New York.

Our most capable president of last year, Robert B. Lea of Sperry, will represent the Society on the Engineering Council, that important link between the engineering colleges and the alumni.

Continuing chairmen of standing committees are Robert M. Smith, of Medical Economics, Rutherford, N. J., for the Publications Committee, and William H. Hill, of Baldwin-Hill Co., Trenton, N. J., on Awards. Wilton Bentley will continue to represent us on the Alumni Nominations Committee.

In addition to the officers and chairmen, the Society's Executive Committee includes eight alumni, two representing each of the major engineering schools at Ithaca. Rather than cover too many names at one time, I'll say something about them in another issue.

To complete the introductions, I suppose I should add that my work has been in the commercial engineering and operating branches of the Bell System, mostly with the New York Telephone Company, and more recently with the A. T. & T. and Western Electric, where I am now engaged in patent licensing work for the System.

I referred before to the objectives of the Society as stated in the masthead and taken from the constitution. When the constitution and by-laws are revised, as I believe they will have to be this year, I hope that the revision committee will consider adding objectives somewhat as follows:

> "To promote the status of the engineering profession."
>
> "To assist in clarifying and emphasizing the responsibilities of engineers and their organizations in finding right solutions to national and world problems."

Surely the pursuance of such objectives would match with the standards and objectives of Cornell itself. The benefit to our political and social, as well as our economic society, of greater appreciation of objective, long-range engineering principles is apparent in all we hear and read.

CARL F. OSTERGREN

Alumni News

Regnald H. Keays, C.E. '95, is inspecting engineer for the Reconstruction Finance Corporation at the Brooklyn Battery Tunnel.

Alonzo G. Trumbull, M.E. '99, chief mechanical engineer for the advisory mechanical committee of the Chesapeake and Ohio, the New York, Chicago & St. Louis, the Erie, and the Pere Marquette, retired after many years in railroad service. Mr. Trumbull is a member of the ASME and was on the executive committee of the Railroad Division of the Society for four years.

Wickham H. Aldrich, M.E. '04, has retired as superintendent of the steam department (power plants and steam heating plans) after nearly thirty-seven years of service with the Cleveland Electric Illuminating Company.

Robert C. Dennet, C.E. '04, is assistant chief engineer for the National Board of Fire Underwriters.

Andrew J. Haire, M.E. '05, was elected president of the Associated Business Papers at the annual spring conference of the organization. Recently vice-president of the ABP, Mr. Haire is president of the Haire Publishing Company which publishes eleven business papers. He is also a member of the Cornell Alumni News Advisory Board.

Bertrand Weiss, C.E. '09, is president of Progress Gas Co., and North American Supply Corporation, engaged in gas construction designing and installing liquified petroleum gas and oil gas systems throughout the country.

Chester S. Ricker, M.E. '11, was director of timing and scoring at the Indianapolis Motor Speedway, and awarded $3,500,000 in prize money at the annual Memorial Day Races.

Nat H. Baier, C.E. '20, is president of Construction Waterproofers, Inc., of New York City, who have specialized for twenty years in the waterproofing of new structures as well as the complete restoration of walls of old buildings.

Harold M. Catlin, M.E. '25, has assumed the position of manufacturing engineering manager for the Bigelow-Sanford Carpent Company.

Samuel B. S. Nelson, M.C.E. '26, has been appointed head of the Water Construction Division of the Los Angeles Water Works. Mr. Nelson will now be in charge of construction of all dams, major pipelines, buildings, pumping and water treatment plants, tunnels and other major projects. He will also direct the inspection of work done for the water system by private contractors. Mr. Nelson is a member of the ASCE and the American Water Works Association.

Andrew J. Haire

Karl F. Kellerman, E.E. '29, was recently appointed executive director of the Guided Missles Commission Joint Research and Development Board.

Jackson Hazlewood, M.M.E. '33, is an account executive with Fuller & Smith & Ross, an advertising agency in Cleveland, Ohio.

Victor K. Hendricks, Chem.E. '33, recently became assistant to the executive vice-president of the Pepsi-Cola Company.

William G. Mitchell, C.E. '33, has joined the Truscon Steel Company.

James C. Forbes, B.S. in A.E.(ME) '36, is now an electrical engineer for the General Electric Company in Cleveland, Ohio.

Elizabeth E. Baranousky, A.E. '37, is a bacteriologist with the Carroll Dunham Smith Pharmacal Company of New Brunswick, N. J.

Luis Torregrosa, C.E. '37, is a member of the firm of Toro, Ferrer y Torregrosa, architects and engineers, which has just received a contract for the design and construction of a 300 room, sea-front hotel in San Juan, Puerto Rico.

William T. Cole, B.S. in AE(ME) '41, is assistant to the president of the Canton Malleable Iron Company, a partner in the General Brass Sales Company, and vice-president of Canton Cast Products Company.

Victor E. Serrell, B.S. in A.E.(ME) '41, is technical representative for the Bakelite Corporation, of Chicago, Ill.

William G. Gerow, B.S. in M.E. '44, is an engineer with the Truax-Traer Coal Company of Illinois.

Pierre Yakovleff, Chem.E. '44, has just accepted a position as chief development and design chemical engineer for the French division of Blaw-Know Company.

Stanley Noss, B.M.E. '45, has been a design engineer for Link Aviation, Inc., since his discharge from the Navy.

Edward C. Roth, '45 B.S. in A.E., is with the Buffalo office of Merrill Lynch, Pierce, Fenner & Beane, underwriters and distributors of investment securities, and brokers in securities and commodities.

George G. Swanson, M.E. '45, is a field application engineer with the Carrier Corporation in Los Angeles, California.

James W. Johnstone, Jr., B.E.E. '46, has been released from the Navy and is working with Day & Zimmerman, Inc., engineers of Philadelphia, Pa.

(Concluded on Page 36)

News of the College

Scholarships

Prof. R. F. Chamberlain, chairman of the Committee on Scholarships, has announced the winners of the 1947 John McMullen Regional Scholarships and also the 1947 National Scholarships awarded to students entering the College of Engineering. McMullen scholars will receive sums ranging from 50 dollars a term to full tuition while those awarded National Scholarships will be given the sum of 600 dollars a term. In order to retain the McMullen awards, the men must maintain at least an 80 average in their respective schools.

Scholarships in Region 1 have been awarded to Rudolph G. Kraft, ChemE, of Longmeadow, Mass.; Lawrence E. Luce, Jr., ME, of Summit, N. J.; Timothy W. Edlund, ME, of Riverside, Conn.; and James T. Ream, ME, of Somerset, Pa. Region 2 awards have been made to Robert J. Hartlieb, ME, of Allentown, Pa.; James J. O'Brien, CE, of Reading, Pa.; Howard B. Day, Jr., EP, of Allentown, Pa., and Richard L. Harris, CE, of Pittsburgh, Pa. Those receiving scholarships in Region 3 are J. Richard Read, ME, of East Orange, N. J.; William E. Denison, CE, of Camp Hill, Pa.; David M. Greason, ChemE, of Maplewood, N. J.; Robert L. Lentz, ME, of Newark, N. J.; and Charles V. Ray, EE, of Lyons, N. J. Region 4 scholarships have been awarded to Donald E. Danly, ChemE, of Washington, D. C.; Hugh M. Chormly, ME, of Washington, D. C.; John E. Nagy, CE, of Baltimore, Md.; George C. Whitely, Jr., EE, of Baltimore, Md.; and Joel M. Larson, EE, of Washington, D. C. One award was made in Region 5 to Edgar R. Taylor, EE, of Jacksonville, Fla.

No scholarships were given in Region 6, while in Region 7 two men received awards: Peter D. Spencer, ME, of Shaker Heights, O.; and Thomas B. Sheridan, EE, of Cincinnati, O. In Region 8, awards were made to Edward G. Lindsley, CE, of Detroit, Mich.; Jack G. Huddleston, ChemE, of Culver, Ind.; James G. Merrion, ChemE, of Culver, Ind.; and Richard J. Farrar, EP, of Indianapolis, Ind.

Thomas B. Gill, Jr., ME, of Maywood, Ill.; John S. Wiley, ChemE, of Oak Park, Ill.; and William G. Paxton, ChemE, of Winnetka, Ill. received the McMullen grants from Region 9. No awards were made in Region 10, but in Region 11 scholarships were awarded to Lyle E. McBride, EE, of Omaha, Nebraska; William A. Basuchle, CE, of St. Louis, Mo.; Jack R. Vinson, ME, of Kansas City, Mo.; and John R. McKinley, ChemE, of Wichita, Kan. Richard J. Farnum, ChemE, of Milwaukee, Wis., received the only award made in Region 12 while in Region 13 no scholarships were granted. Regions 14 and 15 also gave one scholarship each to Paul J. Parsons, CE, of Pueblo, Col., and John B. Lambert, ChemE, of Seattle, Wash., respectively.

National Scholarship winners in the College of Engineering are J. B. Casey, CE, Mohawk, N. Y.; Richard Chittenden, CE, Edmonds, Wash.; Robert E. Fitzner, ChemE, Flossmoor, Ill.; Charles D. Graham, Jr., ChemE, Dayton, O.; Louis P. Howland, ME, Watertown, Conn.; R. C. Mealey, EE, Malvern, N. Y.; John M. Morgan, CE, Livingston, N. J.; George A. Myers, ChemE, Englewood, N. J.; Thomas O. Nuttle, EP, Baltimore, Md.; Richard D. Rippe, ME, Bloomfield Hills, Mich.; and Theodore D. Schultz, EP, Glencoe, Ill.

Promotions

Four members of the faculty of the College of Engineering have been promoted, effective July 1, from associate professor to professor. These men, raised to their present position with 17 men of other colleges in an extensive move last spring, are Alexander B. Credle, E.E. '30, M.E.E. '31, Ph.D '38; Henry B. Hansteen; Clyde I. Millard, E.E. '27; and Howard G. Smith, B.E.E. '30, M.E.E. '31, Ph.D. '37. Credle, Hansteen, and Smith are on the electrical engineering faculty while Millard teaches industrial engineering.

Professor Burrows

Professor C. R. Burrows, Director of the School of Electrical Engineering at Cornell University, has been requested to serve as convener of a recently-established Joint Commission of Radio-Meterology formed by the International Council of Scientific Unions.

Members of the new Joint Commission are nominated by the International Unions of Radio-Sciences, Geodesy and Geophysics, and Physics. Nominees are M. C. P. Lejay and M. Peslat, both of Paris, France; Professor Lugeor, Zurich, Switzerland; Dr. Henry Booker, Cambridge, England; Dr. E. G. Bowen, Sydney, Australia; M. Hagen, Washington, D. C.; M. Thomson, Toronto, Canada; and Dr. Soldie, London, England.

E.P. Society

The students of the first class to matriculate in the Department of Engineering Physics organized last May the Cornell Society of Engineering Physics with a charter membership of 24.

The purposes of the society, as stated in its constitution, are "to foster and promote fellowship among the students, faculty, and alumni of Engineering Physics at Cornell and to provide a means of group action and expression for the students in Engineering Physics."

At the first general meeting held in May, Ronald Wilcox was elected president; William Yetter, vice-president; Herbert F. Spirer, secretary; and John H. Gay, treasurer. These four men composing the Executive Committee, in a short meeting after the regular session, ap-

(*Continued on page 40*)

A GREETING To The CLASS of '52

It is a pleasure to welcome you to Cornell as members of the Class of 1952 in Engineering. Yours is the first class to be entirely on the new five-year curriculum. Under the conditions of our limit on facilities and hence limit on enrollment, you may congratulate yourselves in being exceedingly fortunate in attending the college of your choice.

You would not be here if you had not already demonstrated a high degree of ability in academic work and some degree of aptitude for engineering. Cornell therefore expects great things of you and I am confident that you will not let her down. The country is in great need of well trained engineers, and that need will extend into the future for a considerable time. You have in your grasp the opportunity to become a well-trained engineer in your chosen field. Whether you achieve such distinction rests entirely with you.

Our records show that upon graduation those in the upper portion of the class may expect to receive several times more offers per man than those near the bottom of the class. Your performance in a professional class such as engineering has therefore a practical bearing upon your opportunities at graduation. In effect therefore, you are now entering the profession and your record from this point forward will have a bearing upon your future in engineering.

Success in your whole program is simply the summation of your success year by year, and that in turn is the measure of your success day by day. Each day's work well done can not help but bring success to you. It is as simple as that.

I congratulate you on the opportunity that is before you. The college and its faculty will watch your progress with eagerness and will help in every way they can in assisting you to achieve a full measure of success.

S. C. Hollister, Dean
College of Engineering

Recent Developments In Engineering

Techni-Briefs

V-T Fuze Adapted

The first practical application of the VT fuze, also known as the proximity fuse, which was responsible for much of the effectiveness of anti-aircraft fire during the war, is an adaptation of its motion-detector principle to use in a warning system. At one end of a corridor, behind a glass partition may be placed a micro-wave unit which transmits five-inch-long radio waves from a parabolic reflector. As pedestrians approach or go away from this reflector, the radio waves which bounce back cause variations in the current which the transmitter draws from its power supply. Such current changes, which in the VT fuze caused the shell to explode as it approached a plane, may be made to cause red lights along the corridor to turn on. The device is so sensitive that it will be activated if a person standing in the corridor so much as waves his hand in the direction of the reflector.

Weatherproof Nail

New weatherproof roofing nails, now in production, use a neoprene washer which forms a seal between the head of the nail and the aluminum or other metal sheeting and roofing. This eliminates leakage around nail holes in metal roofs, thus preventing corrosion due to electrolysis. Of the several types of rubber available, neoprene was chosen because of its excellent resistance to all forms of weathering —heat, sunlight, ice, and rain.

Special Cooler

A million dollar, 85-degree below refrigeration system, in some respects believed to be the largest of its kind in the world, is under construction by Eastman Kodak Company. Almost two miles of brine piping, 18 inches or less in diameter, will be used for the cooling units, each capable of turning out 375 tons of refrigeration daily. Another record for such a system, it is believed, is the volume of cooling liquid, or "brine," which the plant will contain—approximately 100,000 gallons of methylene chloride, selected because of its very low freezing point. Ordinary brines would freeze at the temperatures to be used.

Facsimile Equipment

The introduction of facsimile equipment, a form of visual message presentation quite similar to television, so that aircraft in flight can receive weather maps, pictures, enemy troop locations, and printed types of information, is being planned by the Army Air Forces. Other forms of automatic and visual message transmission systems under development include teletype, and symbol and light signal displays.

Since most types of atmospheric noise are practically non-existent in the ultra-high frequency or micro-wave region of the radio frequency spectrum, future aircraft communication systems will rely largely upon this so-called micro-wave region. As aircraft speeds increase, it is obvious that less time will be available for communications; hence this future airborne equipment will also have to be designed for fully automatic operation. By automaic operation, it is meant that, should a pilot wish to talk to a given station, the complete tuning and adjustment of the radio receiving and transmitting equipment will be done automatically merely by means of turning a selector switch.

Concrete Houses

Aimed toward partial solution of Britain's housing problems are 13,000 prefab concrete houses which are in the process of construction. Described as permanent dwellings equal in standard and quality to traditional types of homes, these English prefabs are two-family, two-story, semi-detached units with tiled pitch or flat roof. It is possible for a contractor with no previous experience in this type of work to build a pair of these houses in approximately 410 man-hours, including time for unloading the components at the site. Unskilled labor can be used to erect these structures since no "wet" trades are necessary. Each house is of precast concrete units, economical in timber and simple to erect, requiring no cranes and little scaffolding. The super-structure includes framing and sheathing, forming a shell ready to receive the roof. A half of the two-family unit measures 27 x 19½ feet in plan, and weight of its precast concrete superstructure is approximately 14 tons.

Moisture Remover

A new automatic device, called the Deoxo Puridryer, removes oxygen impurities and eliminates moisture from gases. Installed at any convenient point on the low pressure line, the Puridryer purifies such gases as hydrogen so that less than one part in a million of oxygen impurities remains, and then dries the gas to dew points of better than —50°F. It may also be used with such gases at nitrogen, argon, neon, and saturated hydrocarbons. Capacity of the instrument depends upon the moisture content as well as impurity of the incoming gas. The catalyst used in the purification phase never requires reactivation. It should last indefinitely unless poisoned by sulfur compounds, carbon monoxide, or some organic solvent vapors, which are rarely found in commercial hydrogen.

The Natches River Bridge near Beaumont, Texas. The 245 feet span can be raised to a height of 153 feet, giving ocean-going vessels entry to the river.
—Courtesy Westinghouse Elect. & Mfg. Co.

Book Review

THERMODYNAMICS by George A. Hawkins, Professor of Thermodynamics, Purdue University, Published by John Wiley and Sons, 436 pages, $4.50. Reviewed by Frank O. Ellenwood, Head of the Department of Heat-Power Engineering, Cornell University.

In this book, the author has presented the basic laws of thermodynamics in a concise manner for the purpose of making it suitable for an engineering course of six credit hours.

The book is divided into 21 chapters arranged in a logical manner with the first 12 chapters devoted to Fundamental Concepts; The First Law of Thermodynamics; Properties of Ideal Gases, Solids, Liquids, and Real Gases; Specific Heats of Gases; Properties of Vapors; Non-Flow Processes; The Carnot Cycle and the Second Law of Thermodynamics; Available Energy, Unavailable Energy, and Entropy; Entropy Changes for Ideal Gases and Vapors; and Mixtures. Then follow chapters on Combustion; Flow of Gases and Vapors through Nozzles and Orifices; Ideal Cycles of Internal Combustion Engines; Air Compressors and Air Engines; The Gas Turbine and Jet Propulsion; Vapor Cycles, Mechanical Refrigeration; General Thermodynamic Equations; Introduction to Heat Transfer. At the end of each chapter, a number of problems have been given in addition to a list of references.

The Appendix contains short tables of the properties of steam, ammonia, carbon dioxide, sulphur dioxide, and a number of charts that show the properties of vapors.

The index of 10 pages seems to be well prepared to enable one to find readily the most important subjects.

Concept of Heat

Even when making only a brief review of a book, the reviewer is supposed to note any inconsistencies he may have observed; therefore, it now seems appropriate to mention at least one in this review. On page 17, *heat* is defined as "energy in transit as a result of a temperature difference between the source and receiver." This definition is a modern one that has the hearty approval of the reviewer, but to use it consistently is often a somewhat difficult matter, especially so, if one has been brought up on the older definition of *heat*.

(*Continued on page* 28)

Engineers . . .

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a TELEPHONE engineer

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His head
And his hands.
He may have emphasized electronics or mechanics
Or some other of the many engineering specialties,
But, more important,
He knows his mathematics and science.
He has the engineer's viewpoint and approach—
The ability to see things through.
He's a lot of engineers rolled into one.

* * *

He's happy in his work
And his future looks good.
He's a telephone engineer.

BELL TELEPHONE SYSTEM

Book Reviews

(*Continued from Page 26*)

Consequently, it is not difficult to find many places in which the author has slipped back to the older concept. One such instance occurs on page 155. Here the author, in discussing Joule's experiment, states that "The work was transformed into heat which was manifest by a rise in temperature of the water." Consistency requires that instead of using the word "*heat*" in the preceding sentence, there should be used either "*internal energy*," or "*heating effect*," since to agree with the definition, no "heat" is involved in this discussion until the water transmits heat to some other body at a lower temperature. Many similar slips occur throughout the book.

Prof. F. O. Ellenwood
Head of Heat Power Dept.

INTRODUCTION TO AERODYNAMICS OF A COMPRESSIBLE FLUID by Hans W. Leipman and Allen E. Puckett. The GALCIT Aeronautical Series + 255 pages. John Wiley & Sons, New York, New York $400

The present volume is the fifth to appear in the GALCIT series (Guggenheim Aeronautical Laboratory, California Institute of Technology). It is the first broad and systematic study in English of compressibility effects in aerodynamics and, with experimental planes pushing at the threshold of the supersonic region, should be a welcome addition to all who are interested in the problems that such a venture creates.

The first of the two sections into which the text is divided discusses one-dimensional flow. An introductory chapter dealing with basic thermodynamics is followed by a chapter on the equations of motion in one dimension. The authors then consider isentropic channel flow and the effect of shock waves. They conclude the section with a chapter discussing optical methods of observing shock waves.

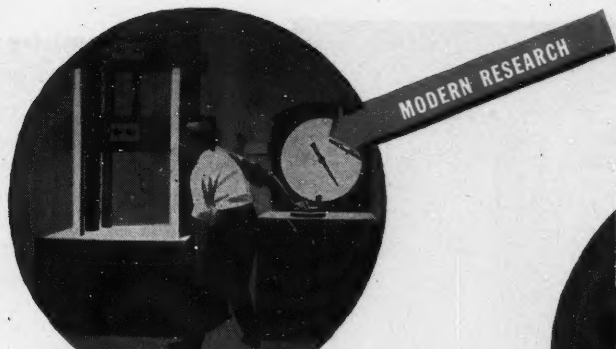
The second section deals with the more difficult problems arising from two and three dimensional motion of a compressible fluid. The authors develop the small perturbation method which results in a linearization of the equations of motion. Such a method is appearing more and more in attacks on non-linear problems in fields other than the present one and should interest the mathematically-inclined engineer. Examples of flow past a wall and around various airfoils are considered.

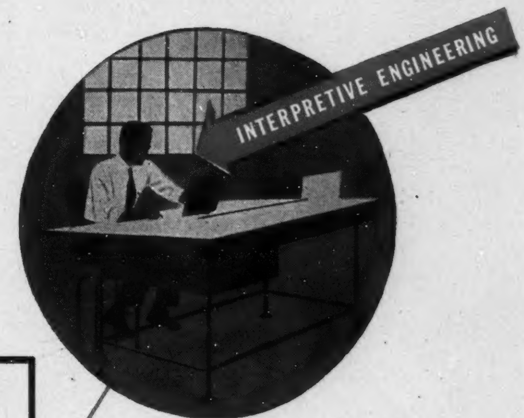
"Exact" Solutions

The hodograph method and the treatment of the resulting linear equations by the approximations suggested by Chaplygin and by Karman and Tsien form a separate chapter. The method is applied to some interesting "exact" solutions for isentropic flow of a perfect gas. Recently it has been applied to a discussion of elbow design for accelerated flow.

The third method considered, that of "characteristic," is applicable only to supersonic flow and is of primary interest in the design of supersonic nozzles. This method is also appearing with increasing frequency.

(*Continued on page 36*)





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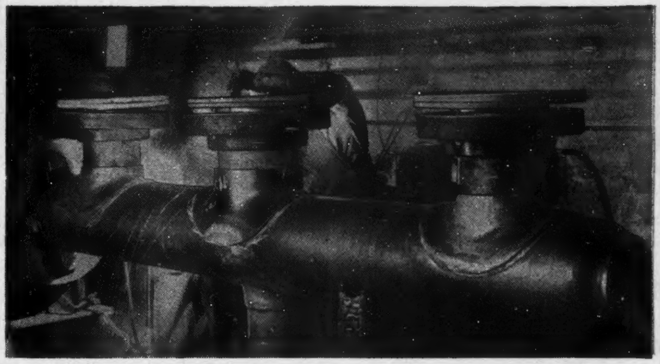

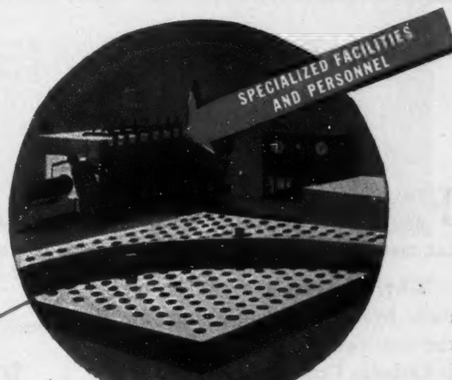

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WHENEVER **PIPING** IS INVOLVED

ENGINEERING GRADUATES HAVE FOUND ATTRACTIVE OPPORTUNITIES WITH GRINNELL IN PIPING ENGINEERING

Organic Chemistry

(*Continued from Page 9*)

increased proportionately. This developed requirement for engineers as well as chemists is strikingly illustrated by statements of one of the largest industrial chemical organization of the United States in a personnel brochure addressed to the college graduate.

Brochure Cited

Discussing the employment opportunities in major technical fields, one notes the following: "The majority of openings . . . for the graduate are in technical work . . . usually in chemical, physical, or biological research; chemical, mechanical, civil, electrical, or industrial engineering . . ."

Further, in describing opportunities in the various manufacturing departments of the company the following pertinent statements are made.

"*Research* — Responsibility for laboratory exploration for new products and processes, improvements in old processes and investigation of uses for products . . . rests with men who have been trained for research in college. The principal fields of training are chemistry, engineering, and physics.

Development — Men trained in engineering principles must demonstrate the practicability of the laboratory findings . . . For such work the company requires men trained in mechanical, electrical, metallurgical, and chemical engineering.

Production—There are many opportunities in a chemical plant for technically trained men. Electric and steam power must be avaliable when and where needed. Machinery, equipment and control instruments must be overhauled, repaired and maintained, new equipment installed. Alterations frequently must be made to existing equipment, and studies of machine speeds, efficiency, standard performance, and plant layout must be conducted. Moreover, there are a number of other types of technical services for which mechanical, electrical, chemical, and other engineers are required; so a staff of capable en-

(*Continued on page 32*)

Organic Chemistry

(Continued from Page 30)

gineers of varied training is highly important."

In the manufacture of such products as rubber, synthetic fibers, and plastics, where physical attributes as well as chemical composition are important, men trained in other types of engineering are employed, for here basic engineering training is more important than specialization.

Familiarity Important

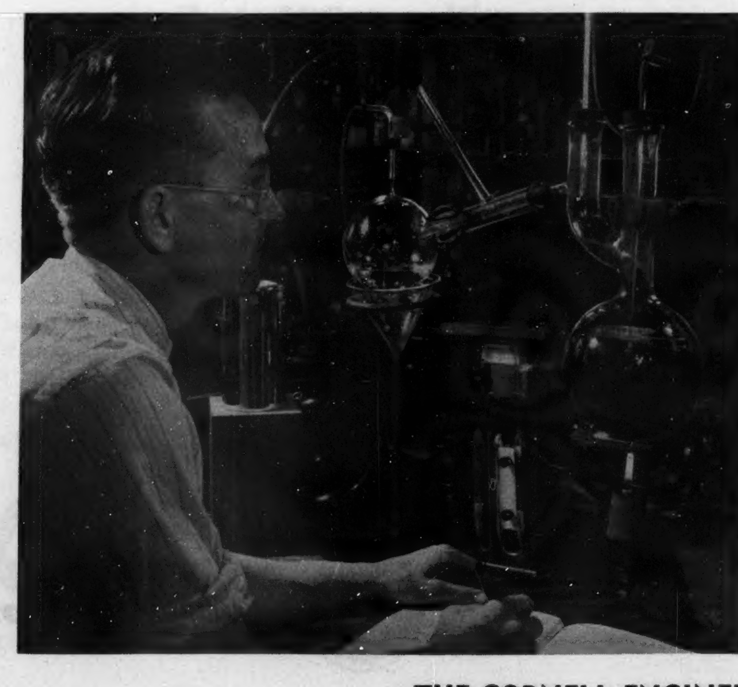
With an increasing number of engineers accepting positions in the various fields of industrial organic chemistry and with practically every graduating engineer encountering products of organic chemistry sooner or later in his professional career, it is important that he have some knowledge of the field. The objective of the new course in organic chemistry will be to acquaint the student engineer with fundamental organic chemistry and its principal industrial aspects.

The first half of the course will be concerned with the basic concepts of the science and with the

(Concluded on page 34)

Distillation under reduced pressure is an important procedure; at the normal boiling points under atmospheric conditions, many organic compounds tend to crack or decompose.

—Cut courtesty *Resinous Reporter*



Organic Chemistry

(Concluded from Page 32)

chemistry of the more important fundamental structural types of organic compounds. This will include, for example, a discussion of the hydrocarbons, alcohols and phenols, carboxylic acids, the carbonyl compounds (aldehydes and ketones), halogen compounds, organic compounds of nitrogen, and the sulfur-containing derivatives.

Industrial Aspects Covered

The latter half of the term will be devoted to selected topics covering those important industrial aspects of organic chemistry which are of greatest interest to the engineer; namely, petroleum, industrial alcohols, rubber, natural and synthetic fibers, and synthetic plastics and resins.

It is hoped that this presentation will prove to be useful and that the young engineer will gain a knowledge and appreciation of organic chemistry which will stand him in good stead in practicing his profession.

Wire Recording

(Continued from Page 17)

European radio stations found wire records more economical for use in broadcasting programs that were delayed for a time, since the steel wire could be used over again an indefinite number of times, whereas celluloid discs could not. In case certain programs were to be stored for long periods, the unbreakable, shock-resistant wire record proved far more practical than the brittle and fragile plastic medium.

Used in Teaching

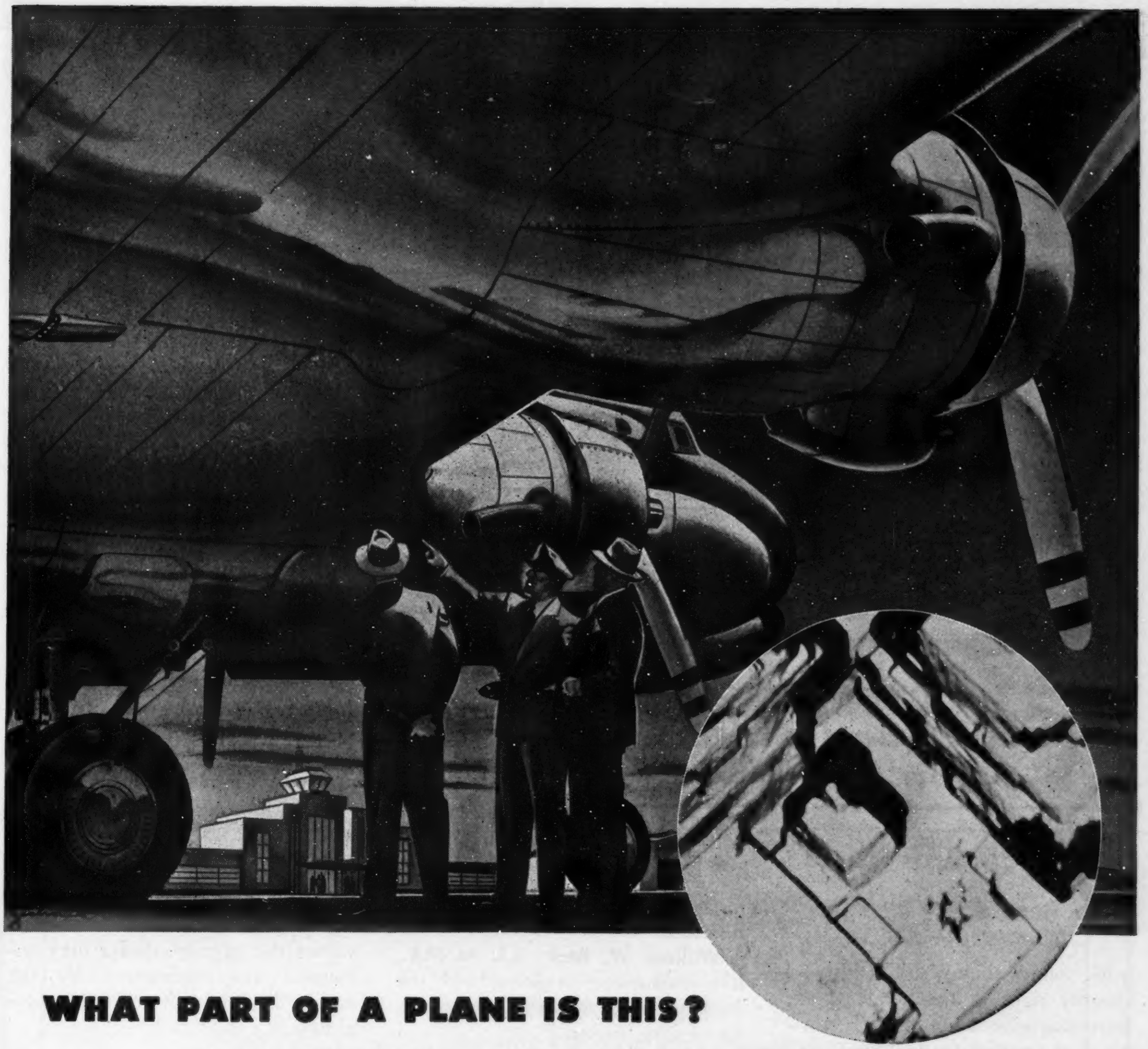
Another example is the dictaphone, common to nearly every business office, which is nothing more than a magnetic tape recorder. More recently, teachers of music and language have found the wire recorder a valuable aid in their profession. Students may make records of their work and then may listen to it immediately, thus enabling them to hear and correct mistakes.

Although best results are obtained when the speaker talks directly into the microphone, conversations going on a few feet away may also be picked up with good results. Conversely, a whisper may be amplified to resound throughout a large auditorum. These characteristics may be applied in recording proceedings of large meetings, and will enable any particular speech or other part of the program to be played back when needed.

Best in Home

In the home, the wire recorder can better anything the present needle-and-disc method can do. It can exclude the necessity for changing records, since a whole symphony or concerto, no matter how long, can be recorded without interruption. Needle "scratch" is eliminated. While it is true that the new vinylite plastic records have lessened scratch almost to the vanishing point, they are still very expensive and their playback life is comparatively short. With the wire recorder, it will be simple for people to make recordings of their voices or any

(Continued on page 36)



WHAT PART OF A PLANE IS THIS?

Clue: 31,700 would cover a pinhead

It is part of the wing surface . . . an area so microscopic that 31,700 spots like this would barely cover a pinhead.

You are looking at aluminum through an electron microscope, the way Alcoa Research scientists look at aluminum alloys in our laboratories. They get down to aluminum's *really* fine points . . . explore among the atoms.

Studying structures like this is one of the ways Alcoa metallurgists learn how to improve aluminum alloys and how to make new ones. By scientific experimentation they combine with aluminum the *right* amounts of the *right* metals to produce the results they want . . . alloys as strong or stronger than structural steel, at one-third the weight . . . alloys that make better castings, forgings, extrusions . . . alloys for innumerable uses

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MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

Wire Recording

(Concluded from Page 34)

other sounds they wish quickly and cheaply right in the home. If the ferro-magnetic alloy used is rust-proof, the recordings will keep their fidelity indefinitely, no matter how many times they are played.

New applications are being found every day in all fields of scientific and commercial endeavour. Wire recording is a "war baby" with promises of a big future.

Alumni News

(Concluded from Page 21)

William E. Okerson, B.S. in C.E. '46, is an engineer with the building division of the engineering department of the New Jersey Bell Telephone Company.

Richard E. Goll, B.S. in M.E. '47, has started as a sales engineer in the development engineering department of the L. H. Gilmer Division of the U. S. Rubber Company.

E. Walton Ross, B.M.E. '47, is a cadet engineer in a one-year training program with Ansco, in Binghamton.

William W. Beck, B.S. in M.E., is a mechanical engineer with the Pennsylvania Refining Company, Karns City, Penna.

Book Reviews

(Continued from Page 28)

Those interested in the physical problems which arise will benefit from the discussions of shock waves in nozzle, speed and pressure measurements, supersonic wind tunnel design, The Schlieren, shadow, and interferometer methods of flow observation, the effects of viscosity and the comparison of high-speed airfoil theory with experiments. Some of these topics are discussed briefly but they can be read with profit.

The mathematically inclined will benefit vastly more for it is the mathematical methods discussed in the last section of the texts which give the volume its principal usefulness and are essential to a fuller understanding of what happens in high speed flight. Some of the difficulties the average reader may encounter are ameliorated by the earlier discussion of one-dimensional flow.

Generally Useful

Some criticisms may be raised without in any way detracting from the general usefulness of the text. The introductory chapter on basic thermodynamics contains a definition of entropy based on the equation $ds = (dQ/T)$ where dQ represents the sum of heat entering the system plus heat arising from dissipation of kinetic energy inside the gas. There are not "two kinds" of heat and it would seem preferable to the reviewer to avoid this method of phrasing in favor of that more customarily adopted.

The discussion of the second law is too brief to be useful and it does not follow that the three forms in which it is expressed are necessarily equivalent. Throughout the text

(Continued on page 38)

Book Reviews

(*Continued from Page* 36)

now one form then again another form of the same equation proves useful and there is a great deal of manipulation from one equation to its equivalent. It would perhaps be of assistance to the reader if the more important relations were summarized. Occasionally, additional explanations would make the diagrams clearer. No list of symbols is provided and the text contains no problems. A bibliography in the rear will be of interest to those who wish to go beyond the range of the present volume.

These criticisms are minor and understandable in a book whose main concern is with recent developments. The authors are to be thanked for introducing a vital subject whose present and future importance are bound to be tremendous.

Herman A. Lang
Asst. Prof. Mechanics of Eng.

MATRIX AND TENSOR CALCULUS, with applications to mechanics, elasticity, and aeronautics By Aristotle D. Michal. GALCIT Aeronautical Series. John Wiley and Sons, New York. 1947. 132 pp.

The author says in his preface that this book is based on lectures given, in a war training program, to research engineers. The book packs many important ideas and applications into 18 short chapters.

Part 1 gives matrix calculus and applications. Matrices, and sums, products, and inverses of matrices are defined and illustrated by examples, pp. 1-14. Exponentials, derivatives, and integrals of matrices are defined, pp. 15-19. Matrices are then applied to systems of linear differential equations, pp. 20-23; to oscillations about points of stable equilibrium, pp. 24-31; to aircraft flutter, pp. 32-37; and to elastic deformations, pp. 38-41.

Part 2 gives tensor calculus and applications. The summation convention and curvilinear coordinates are introduced, pp. 42-47. Tensors and symbolisms are defined, pp. 48-59. The Laplace, wave, and Poisson equations are given in curvilinear coordinates, pp. 60-68. Ten-

(*Concluded on page* 40)

Book Reviews

(Concluded from Page 38)

sors are then applied to hydrodynamics, pp. 69-74 and to elasticity, pp. 75-94. The more general tensor analysis in Riemannian spaces is developed and applied to classical mechanics, pp. 95-102. The final chapter, pp. 103-110, applies tensor calculus to the boundary-layer problem in fluid flow.

Excellent Index

Notes, pp. 111-123, on the text give history, references, and proofs. Four pages, pp. 124-127, give references to papers and books where one may find elaborate treatments of many of the topics which were necessarily treated briefly in Michal's book. Last, and not least, is an excellent index.

Ralph P. Agnew
Professor of Mathematics.

College News

(Continued from page 22)

pointed Robert Berquist social chairman for the 1947-48 school year.

Membership in the society is open to those students with at least one term's residence in the department and with evident interest in the society. Members of the class of '52 will be offered the opportunity to join the organization in the spring after they have fulfilled their one-term residence requirement.

Professor Lawrence Dies

A great loss to Cornell was the death on August 10th of Leonard A. Lawrence, associate professor of surveying. Professor Lawrence was born in Calais, Maine, and received his B.S. degree from the University of Maine in 1904. He served as an assistant in summer surveys there until 1907 when he came to Cornell as an instructor in the School of Civil Engineering. In 1916 he was made Assistant Professor of Surveying, and in 1944 appointed to the position which he held at the time of his death. He was on leave of absence during the school year '46-'47 due to his health, but was attending the Summer Survey Camp at Watkins Glen just before his death for his condition had seemingly improved. Professor Lawrence was appointed Secretary of the Faculty of the Civil Engineering School, and served during the last spring term. He was a member of Acacia, Phi Kappa Sigma, Quill and Dagger, Pyramid, and an honorary member of two track clubs of the Athletic Association. He was the faculty advisor for the cross country squad, and timer and judge at Cornell track meets for many years.

Anderson Honored

Laverne R. Anderson, who received his B.S. in electrical engineering last February and was Editor-in-Chief of the CORNELL ENGINEER during his senior year, has been awarded a Gerard Swope Fellowship. The fellowship was awarded by the General Electric Educational Fund, which this year presented six Gerard Swope Fellowships and eight Charles A. Coffin Fellowships to students in technical

(Concluded on page 42)

College News

(*Concluded from page* 40)

schools throughout the country.

The committee selecting the winners consisted of representatives of the American Society of Mechanical Engineers, the American Society for Engineering Education, the American Physical Society, American Institute of Electrical Engineers, the American Chemical Society, and the National Academy of Sciences. Eleven Gerard Swope

Diesel Lab Burns

During a severe electrical storm on August 15th, the temporary building containing the large Diesel engines was struck by lightning. Damage centered around the main switch board and most of the electrical circuits were burned out. The roof and the north wall of the building were badly burned, and there was some damage from water, but damage to the engines themselves was comparatively slight. They must be completely dismantled and checked however before they can be put into use again. The cost of the fire is estimated to be roughly around $30,000. The Diesel engines were used in the navy training program during the war and were donated to the University last year.

Robert T. Harnett

(*Concluded from page* 19)

generation and distribution when he completes his tenth term in June.

Bob has been out on the university golf course several times this fall. He suggests that he would do much better, possibly break into the nineties for an eighteen, if some of the trees were cut down and sand traps removed. Many Cornellians echo his sentiments. Bob sports a better than fair game of tennis, too. When winter assails the hill, he is not to be seen on skiis and only rarely on Beebe Lake. But with the coming of spring, Bob takes a look at his fishing equipment and yearns for summer when he can spend a few weeks in Michigan to do justice to his favorite hobby.

STRESS *and* STRAIN...

Joe: "Have you got a picture of yourself?"
Roommate: "Yeh."
Joe: "Then let me use the mirror. I want to shave."

* * *

Senior Chem E.: "Give me some of that prepared minoaceticacid-ester of salicylic acid."
Druggist: "Do you mean aspirin?"
Chem E.: "Yeah! I never can remember the name of that stuff."

* * *

Fine Arts Professor: *"I was terribly disappointed in that gentleman you introduced me to last night."*
Liberal Arts Prof: *"Indeed! How so?"*
F.A.P.: *"Why, you spoke of him as a bridge expert, and he turned out to be nothing but a famous engineer."*

* * *

"It's not just the work I enjoy," said the taxicab driver, "it's the people I run into."

* * *

Papa: *"Stop reaching across the table, Junior! Haven't you got a tongue?"*
Junior: *"Yes, but my arm is longer."*

* * *

Gerry Kaplan was visiting in Washington, but wanted to call someone in Baltimore. It annoyed him when the operator said "Deposit twenty-five cents, please." "What!" he cried. "Twenty-five cents to call Baltimore? Why, at home we can phone to hell and back for a nickel."
"Oh, yes," she replied, "But that's a local call."

Mother: *"Billy, what on earth are you doing, looking down Fido's throat?"*
Billy: *"Looking for the seat of my pants."*

* * *

A Georgia Congressman had put up at an American-plan hotel in New York. When, upon sitting down at dinner the first evening of his stay, the waiter obsequiously handed him a bill of fare, the Congressman tossed it aside, slipped the waiter a dollar bill, and said, "Bring me a good dinner."
The dinner proving satisfactory, the Southern member pursued this plan during his entire stay in New York. As the last tip was given, he mentioned that he was about to return to Washington.
Whereupon the waiter, with an expression of great earnestness said:
"Well, sir, when you or any of your friends that can't read come to New York, just ask for me!"

* * *

First Engineer: *"Let's cut mechanics today."*
Second Engineer: *"Can't. I need the sleep."*

* * *

Then there was the ill-humoured civil engineer who always built cross roads.

* * *

Prison Warden: "I've had charge of this prison for ten years. We're going to celebrate. What kind of a party do you boys suggest?"
Prisoners: "Open House."

* * *

"You'd jump, too, if you had amps in your pants," said the convict as the guard pulled the switch to the electric chair.

A Scot was engaged in an argument with a conductor as to whether the fare was 25 cents or 30 cents. Finally the disgusted conductor picked up the Scot's suitcase and tossed it off the train just as it passed over a bridge.
"Mon!" screamed the Scot. "It isn't enough to try to overcharge me, but now you try to drown my little boy!"

* * *

"Hello, is this the Home Economics School?" asked the Cornell bride, who had been married for only two weeks.
"Yes it is," came the reply.
"Well, those biscuits you taught me how to make, I don't think they are very good."
"Why not?"
"My husband sat down at the table five days ago, and ate six of them. Then he just sat back and smiled."
"Smiled, eh?"
"Yes, and he's still sitting there smiling."

* * *

An actor who was married recently for the third time, and whose bride had been married once before, wrote across the bottom of the wedding invitations: "Be sure and come; this is no amateur performance."

* * *

Six-year-old Mary awoke about three o'clock in the morning. "Tell me a story, Mama," she pleaded "Hush, darling," said mother, Daddy will be in soon and tell us both one."

* * *

WANT AD: For trade — One study lamp for good bed. Am transferring from Engineering to Arts.